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Journal of the Society of Arts.

FRIDAY, FEBRUARY 15, 1856.

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MEMORANDUM

Respecting the Proposal to Examine and Grant Diplomas to Students of the Classes in Institutions in Union with the Society of Arts.

The subject of promoting classes for systematic instruction in the Institutions associated with this Society has long been under the consideration of the Council of the Society of Arts. In the early part of 1853, the Council appointed a Committee to inquire into the subject of industrial instruction. This Committee obtained a large amount of most valuable evidence on the subject of classes and class examinations, a selection from which was published in an Appendix to the Report of that Committee, issued under the sanction of the Council in June, 1853.*

The subject of examinations, to be followed by certificates, was brought before the Conference of the Representatives of the Associated Institutions, held at the Society's house in the Adelphi, in July, 1854, when it was unanimously resolved:—"That the Conference cordially approve, and request the Council to carry out their proposed system for examining and granting certificates to the students of classes of the Institutions in union with the Society."

In June, 1854, Viscount Ebrington addressed to Mr. H. Chester, at that time chairman of the Council, a letter, urging the importance of organising a system of examination in rural districts; and at the Conference in July, 1854, it was unanimously resolved:—"That the Council be requested to prepare a plan for extending to the inhabitants of rural and other districts, where the establishment of Mechanics' Institutes is difficult or impossible, the benefit of connection with this Society, and of the local examinations proposed to be established by the Society in concert with the local Institutions associated with it."

The subject was again brought under the notice of the Council at the Conference in June last, and at the opening of the current session its importance was pressed on the attention of the Society at large in the address of the Rev. Dr. Booth, the present chairman of the Council.

Notwithstanding the admitted importance of examination as an efficient instrument for the promotion of education, and as the surest test of intellectual capacity and attainment, but few candidates presented themselves for examination. The idea of such a system was novel, and its advantages not immediately apparent. Meanwhile the political exigencies of the country imperatively called for the adoption of that very system which the Council of the Society of Arts had vainly attempted to introduce among its associated Institutions.

Success in competitive examination has very recently become the sole passport to employment in the civil service of the East India Company. Success in examination is also a necessary preliminary to admission into the Royal Artillery and the Royal Engineers, into the Admiralty, into the War Department, into the Privy Council Office, and into the Government departments generally. Examination has been revived in the Inns of Court, and it is in contemplation to incorporate them into a legal university. Now that minute and systematic examination into the natural ability and acquired attainments of candidates for employment in their services which the Crown and the East India Company are enabled efficiently to secure, the Council of the Society of Arts would desire to effect for the Manufacturing and Commercial interests of the country. It is obvious that the valuable employments connected with these bodies will always secure a large supply of well instructed Candidates. Though the Society of Arts cannot hold out equal inducements, yet there can be little doubt, that were the extensive commercial establishments of this country, the great employers of labour, the railway companies, the large manufacturers, and the friends of education, to agree to recognise the results of the examinations conducted under the sanction of the Society of Arts, and set forth in *Certificates* awarded with discretion and integrity, a great boon would be he held out to the unfriended talent of the country. The Society of Arts' Certificate would thus be accepted, instead of the vague and worthless testimonials so frequently and so heedlessly given.

It is hoped that few will look coldly upon an attempt to supply to the members of the Literary and Scientific Institutions, Mechanics' Institutes, and Athenæums, in union with the Society of Arts, a portion, however small, of those advantages which are abundantly offered to the higher classes of the community at the Universities in their competitive examinations, honours, and degrees.

To ascertain how far the public may be prepared, practically to co-operate with the Society in the laborious and useful task it has undertaken, the Council invite the adhesion of the friends of education, of the railway companies and other public bodies, of large commercial houses, of engineers, manufacturers, contractors, and other great employers of labour, to the following

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* The Report of the Committee appointed by the Council of the Society of Arts to inquire into the subject of Industrial Instruction, with the evidence on which the Report is founded. Published under the sanction of the Council. Pp. 232, price 5s. Longmans and Co., 1853.

DECLARATION.

We, the undersigned, having considered the memorandum of the Council of the Society of Arts, and the plan therein set forth, for examining and granting certificates to the students of classes for adult instruction in the Literary and Scientific Institutions, Mechanics' Institutes, Athenæums, and other similar bodies in Union with the said Society, do hereby declare that we desire to promote the success of the said plan, and are prepared to regard as *testimonials worthy of credit* such certificates as may be awarded in conformity thereto.

In accordance with the unanimous recommendation of the Meeting of Representatives, held at the Society's house on the 18th of last month, the Council propose to give effect to the views of the Institutions so repeatedly expressed, and to hold examinations at which certificates of merit shall be duly awarded.

The following Rules and Conditions have been made by the Council.

1. That every candidate for examination shall have been for a certain period a regular attendant at a class in an Associated Institution.
2. That the examinations shall be conducted by men of distinguished reputation and superior attainments, so that their awards may justly command the confidence of the public.
3. That the examiners may award certificates of three grades of merit.
4. That first-class certificates be very cautiously awarded, so as to indicate a high degree of solid attainment.
5. That the examinations be held at the Society's house in the Adelphi, during the week commencing the 9th of June, 1856.
6. That candidates who propose to offer themselves for examination, shall give notice of their intention in writing, to the Secretary, on or before Saturday, the 31st of May, 1856.
7. That the ensuing examinations shall comprise the elements of mathematics (including arithmetic), mechanics, physiology, botany, chemistry, political and physical geography, English history, English composition, the Latin, French, and German languages.
8. That every candidate shall be examined in two of the above subjects at least.
9. That the examiners prepare a statement, in which shall be clearly set forth within what limits they will examine in the above subjects, and the text books which they recommend.

N.B.—Candidates will be expected to possess a competent knowledge of writing and spelling.

Mr. Robert Stephenson, M.P., F.R.S., President of the Institution of Civil Engineers, and Vice-President of this Society, having given a donation of ten guineas, to be applied to promote the system of examinations which are now being established for candidates from classes at Mechanics' Institutes, the Council have determined to offer it as a "Stephenson Prize," to be awarded to that person who shall pass the most successful examination in Mathematics and Mechanics, and obtain a first-class certificate in each. Mr. C. Wentworth Dilke, Vice-President, has offered a prize of ten guineas, to be awarded by the Society's examiners to the candidate who shall pass the best examination in English History.

CLASS BOOKS FOR INSTITUTES.

A deputation from the Council, consisting of Wm. Ewart, Esq., M.P., the Rev. Dr. Booth, F.R.S., Chairman of the Council, Col. Sykes, F.R.S., Mr. G. F. Wilson, F.R.S., Mr. Winkworth, and Mr. Le Neve Foster, M.A., secretary, had an interview yesterday afternoon with the Lord-President of the Privy Council, on the subject of extending to Mechanics' Institutes, and other Institutions in Union with the Society of Arts, the privileges in regard to the purchase of books and apparatus now enjoyed by schools under inspection.

The deputation were most favourably received, and his lordship stated that the subject should have his best consideration.

SURPLUS FROM PATENT OFFICE FEES.

The Council of the Society of Arts, acquiescing in the objects of the letter of Sir Joseph Paxton, published in No. 167 of this Journal, appointed a very large and influential Committee of inventors and others to consider and report upon the subjects therein referred to. The first meeting of this Committee took place last Friday, when there were present, among others, Lord Stanley, M.P., Sir Joseph Paxton, M.P., (who was called to the chair, on the motion of Dr. Booth, F.R.S., chairman of Council,) Messrs. W. Bridges Adams, I. G. Appold, F.R.S., T. Aston, J. M. Blashfield, I. Braithwaite, Dugald Campbell, E. Chadwick, C.B., R. L. Chance, Henry Cole, C.B., Dr. J. H. Gilbert, Peter Graham, A. C. Hobbs, Owen Jones, Charles May, F.R.S., I. J. Mechi, T. Webster, F.R.S., E. Woods, and C. Wordsworth.

It appeared to be the unanimous opinion of the meeting that the first thing to be done was to obtain the recognition by the Government of the principle that the revenue arising from patent fees should not go into the general revenue of the country, but should be applied specially for the promotion of the progress of invention. It was shown that this very point was advanced by the Committee of the Society which obtained the Patent Law Amendment Act of 1852, and that one of the heads of a bill prepared by that Committee was:—"18. That the surplus profits, after paying office expenses and compensations, should be directly applied to some public purpose connected with invention, but not be carried to the consolidated fund." In speaking of the surplus, it should be understood that under the existing system all fees taken at the Patent Office are collected in the form of stamps, and thus go directly into the general revenue of the country. The expenses of the Patent Office are included in the estimates voted annually by Parliament, and on the magnitude of this vote does the power of the Patent Office for good depend. The Amendment Act of 1852 was never looked upon as a final measure. It was remarked by Mr. Webster, that it was all that could be obtained at the time,—not all that was wanted,—and whilst we were thankful for what was done then, we would now begin again. When once the principle was recognised by the Government, that the surplus arising from Patent Office fees should not form part of the general revenue of the country, then would come the inquiry, as to how best it might be disposed of. It was agreed on all hands to be desirable that all specifications, including those for the last 200 years, should be printed and published at a low rate; and that they should be properly arranged and classified. It was only by such means that we could arrive at a knowledge of what had been proposed, and hope to avoid some of the loss of labour of re-invention. It was absolutely necessary for the progress of invention that what had been done in the past should be known. Thus it has lately been ascertained, that about 150 years ago, a patent was taken out for a revolver, and one had also been granted many years back for a reaping machine. These ideas, now proved to be sound and good, failed to be carried out at the moment, owing probably to the then imperfect state of mechanical science. The world was not ripe for them; but it was desirable that they should be preserved where they would be easily accessible and could be constantly seen, so that the ideas might never be lost. Mr. Chadwick mentioned that it had recently come to his knowledge that the same invention had been patented no less than fourteen times. He had no doubt that every one of the fourteen individuals had absolutely re-invented the article in total ignorance that anything of the kind before existed. Mr. May, on this point said that an endless band-saw, which was shown in the French Exhibition, and was said to be a French invention, had been patented in England so far back as 1808; also, that the same mechanical arrangements precisely had been re-patented in 1837, and again in 1846. If easily accessible, and proper records had existed, this could hardly have happened.

In regard to the question of models, it was thought not to be to the advantage of the public to follow the American plan of requiring a model to be deposited of every invention capable of being so illustrated. The American Model Gallery is little better than a lumber-room. Besides, many things of questionable value are patented, and the models in most cases would be rude, and behind the time. Again, many patents are taken out for improvements in details of mechanism; these could not be faithfully exhibited by a model or specimen of the part so improved—the whole machine would be necessary. It seemed to be agreed that models, to a limited extent, might be useful. On this point, Mr. Webster said that there were often prepared, at great expense, for use in the Law Courts—and, he feared, there must always be litigation in regard to patents—historical series of models of some particular invention. Now, if instead of permitting these to be dispersed, as at present, and probably, after a time, broken up, they were all collected at the Patent Office, a complete history of the progress of successful inventions would be obtained. What was wanted was the leading types of successful inventions, those which marked eras in industrial progress, from which new industries arose, or which gave to old ones a new development. Mr. Charles May said that everyone engaged, either in taking out patents, in managing patents, or in giving evidence in patent cases in courts of law, must be thoroughly convinced that a radical change was wanted. He hoped that the law would be amended *ab initio*. The present form of obtaining patents by petition to the Commissioners, who neither by time nor education could possibly understand anything of the merits of the application, was absurd, and the fees to the Attorney and Solicitor generals for doing "worse than nothing," were little less so. Mr. T. R. Crampton thought the present scale of fees too high. It was higher than in any other country except the United States. From practical experience, he had found no difficulty with low fees, and in France the arrangements were so simple that it was a pleasure to take out a patent there. Mr. A. C. Hobbs would, on another occasion, enter into the question of what privileges the patent law should confer. At present it gave a man no right, but only the power to sue. Mr. Webster thought that the wholesome working of the present system of repeated payments—that is, £25 for three years, £50 at the end of the third year, and £100 at the end of the seventh year—was shown in the fact that about two-thirds of the patents dropped after the third year. Thus obstructive patents were cleared off, but still they would be recorded and published for the benefit of others. The unwearied and indefatigable exertions of Mr. Bennet Woodcroft, Superintendent of Patents, were highly commended, and the increased facilities and improvements which had taken place within the last few years were mainly to be attributed to that gentleman, with whom the task was considered to be a "labour of love;" and it was thought that if Mr. Woodcroft were allowed full scope, there would be little to complain of.

The following resolutions were passed unanimously:—

Moved by Lord Stanley, M.P., seconded by Mr. Henry Cole, C.B., and

Resolved,—That this Committee concur unanimously in the importance of saving the surplus from absorption in the general public revenue, and that a deputation of patentees and others seek an early interview with the Prime Minister for that purpose.

Moved by Mr. Charles May, F.R.S., seconded by Capt. L. L. Boscawen Ibbetson, F.R.S., and

Resolved,—That it is highly desirable to place the Patent Office upon a footing correspondent with the permanent industrial position of the country, and that steps be taken to press upon the Commissioners of Patents, upon the Government and the legislature, the propriety of having the surplus arising from patent fees appropriated to that object.

Moved by Mr. A. C. Hobbs, seconded by Mr. R. L. Chance, and

Resolved,—That a report founded on the foregoing resolutions be addressed to the Council of the Society of Arts, inviting the Council to exert all its influence in obtaining the practical realisation of the objects therein proposed.

Moved by Mr. T. R. Crampton, seconded by Mr. Dugald Campbell, and

Resolved,—That a Sub-Committee be appointed to consider the present scale of fees and the details requisite to be carried out for placing the Patent Office on a footing of efficiency worthy of the nation.

Moved by Mr. T. Webster, F.R.S., seconded by Lord Stanley, M.P., and

Resolved,—That the thanks of the meeting be given to Sir Joseph Paxton, M.P., for his letter, and that he be requested to continue his exertions in behalf of inventors and the advancement of practical science.

DECIMAL COINAGE COMMISSION.

It is understood that the Commissioners have appointed Archibald Smith, Esq., of the Chancery bar, and George Shaw Lefevre, Esq., of the Middle Temple, Joint Secretaries to the Commission. It is said that meetings of the Commission were held on Wednesday and Saturday in last week.

NINTH ORDINARY MEETING.

Wednesday, February 13, 1856.

The Ninth Ordinary Meeting of the One Hundred and Second Session was held on Wednesday, the 13th instant, Apsley Pellatt, Esq., M.P., in the chair.

The following Candidates were balloted for and duly elected Ordinary Members:—

Fisher, John.
Fletcher, Robert
Johnston, James, jun.
Longbottom, Abram.
Mitchell, William.

The paper read was

ON THE MANUFACTURE OF CROWN AND SHEET GLASS.

By Henry Chance, M.A.

The admirable manner in which the curiosities of one great division of the glass manufacture, that of flint glass, have been recorded by an able chronicler,* induces me to confine myself to another and scarcely less interesting branch, the manufacture of blown window glass. The history of this glass is most scanty, when compared with the abundant proofs which Egypt, Greece, and Rome, have left behind, of their daily use of vessels and ornaments of glass, and of the skill of those who fashioned them. The general silence of the ancient writers, and the lack of all allusions to the subject, are sufficiently convincing of their ignorance: and, even in the first century of the Christian era, the words of Seneca and Philo might bear a doubtful meaning, but for the evidence of an unimpeachable witness. Pompeii, awakened from a slumber of seventeen hundred years, has proved the existence of window glass in the days of the early emperors. In a small chamber, attached to the bathing-room of a private dwelling-house, excavated about the year 1763, was found, "a window, closed by a moveable frame of wood, which, though converted into charcoal, still held, when it was found, four panes of glass about six inches square." And, in 1824, in a room connected with the public baths, was discovered "a window, two feet six inches high, and three feet wide, in the bronze frame of which were found set four very beautiful panes of glass, fastened by small nuts and screws, very ingeniously contrived, with a view to being able to remove the glass at pleasure." But this disclosure goes no further than to prove the then existence of such glass, and does not interfere with our belief that windows of that age were generally glazed with mica stone, or lapis specularis, obtained chiefly from Cyprus, Spain, and Cappadocia. In the fourth century, Lactantius and St. Jerome allude to window glass, and we hear of glass in churches and public buildings, but then, and long after, in these only. Nearly three centuries later, in 674, the Abbot Benedict, so saith the venerable Bede, sent for artists from beyond seas to glaze the church and monastery of Wearmouth, and York Cathedral was glazed about the same time. In the eleventh and twelfth centuries, glass was generally employed in the windows of the numerous religious edifices which the pious enthusiasm of that period called into existence; but the specimens handed down to us fall so far short of the products of today, that we can scarcely believe, what is undoubtedly the fact, that the two are results of processes substantially the same.

White glass, for house windows, was not introduced into England until the close of the twelfth century; but, even as late as the sixteenth century, it had not entirely displaced the imperfect method of transmitting light through oiled paper, linen cloths, and wooden lattices. In the minutes of a survey of Alnwick Castle, made in 1573, the following curious entry occurs:—"And because, throwe extream windes, the glasses of the windowes of this and other my lords castels and houses, here in the country, dooth decay and waste yt were good the whole leightes of everie windowe, at the departure of his lordshippe from lyinge at anie of his sade castels and houses, and dowring the time of his lordshippes absence, or others lyinge in them, were taken downe and lade up in safetie, and at sooch tyme as other his lordshippe or anie other sholde lye at any of the sade places, the same might then be set uppe of newe with smale charges to his lordshippe; whereas now the decaye thereof shall be verie costlie and chargeable to be repayred."

Glass was, probably, not applied to the windows of English farm-houses before the reign of James I. It is mentioned, in 1615, in a lease in the parish of Suffolk, but as late as 1661 in Scotland, "the windows of the ordinary country houses were not glazed, and only the upper parts of those of even the king's palace had glass, the lower ones having two wooden shutters, to open at pleasure and admit fresh air.

These scanty supplies were chiefly imported from abroad. The manufacture of blown window glass in England existed in the fifteenth century, and, perhaps, even prior to that period; but the glass then produced was of a very inferior description, and the first works of note established in this country, were those of Sir Matthew White Ridley and Co., on the river Tyne, at Newcastle, about the middle of the seventeenth century.

Crown and sheet glass are classed among the simple varieties, and are a compound of silica, soda, and lime, the result of the union of silicic acid with two separate bases. Let us regard, for a moment, each of these silicates apart. Silica and soda may be combined by water or by fire, either by the addition of silicic acid to a boiling solution of caustic alkali, or by mixing the two in a dry state and exposing them to the action of heat. In either case the resulting silicate is soluble, more or less so, according to the greater or less proportion of alkali, but still always soluble. The usefulness of this solubility has, of late years, been much developed. In 1844, Mr. Ransome patented the employment of this glass in the manufacture of artificial stone, by mixing it, when dissolved and evaporated to the consistence of a gum, with sand, limestone, and other substances. And quite recently, Mr. Gossage has substituted it for alkali in the manufacture of soap. Its application to the rendering wood uninflammable is of much older date. But for window panes, it is of course quite useless. Nor is the simple silicate of lime more practicable. It is the result only of the most intense heat, and assumes the form more of a slag than a glass. But the union of these two silicates produces a hard, cheap, and transparent material, not indeed absolutely insoluble, but capable of resisting the action of water for a very long period.

The principle ingredient of this trio is silica—which, already distinguished, as the chief element of the bricks with which we build our houses, is now no less distinguished as the chief element of the glass by which we furnish them with light.

The manufacturer employs silica in the shape of sand, selecting such as the microscope and analysis show to be most suitable for his purpose. Every country in which glass is manufactured abounds in this material. The finest English sands are from Alum Bay, in the Isle of Wight, and Lynn, on the coast of Norfolk. The French obtain a very superior sand from the Forest of Fontainebleau, in the neighbourhood of Paris, and to the purity of this and their other materials, the superior colour of their glass may be partially ascribed.

The next important element is soda, which is preferred for this kind of glass, as a cheaper ingredient, to potash. As the use of soda, in its present form, is a comparatively recent introduction, I was anxious to obtain information as to the steps which led to so important an improvement; and I have to thank M. Bontemps for a valuable communication on the subject. Not more than thirty years have elapsed since crown and sheet glass were manufactured from crude alkali obtained from the ashes of a certain sea-weed, and in this country known by the name of kelp. The preparation of kelp for this purpose employed a large population on the northern shores of Scotland and west of Ireland, and the abandonment of this material plunged whole districts into idleness and misery. This kelp was used in combination simply with sand—the kelp containing soda and potash, and furnishing the lime necessary for the composition of the glass. But the glass thus produced was of very variable character, arising from the uncertain quality of the kelp, and also of a very inferior colour, evidence of which is still to be found in the old windows of ancient houses, that have escaped the ravages of improvement.

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* See Mr. Apsley Pellatt's "Curiosities of Glass-Making,"

A similar crude alkali was employed in other countries, under the name of barilla, soda of Alicant, etc., and at Venice, and in the South of France, this was mixed with a natural product called the natron of Egypt, and containing carbonate, sulphate, and muriate of soda.

The discovery of Le Blanc, in 1792, which effected the conversion of common salt into carbonate of soda, was the commencement of a new epoch in the history of this glass. The manufacturers of soap at Marseilles ceased to import the soda of Alicant, and employed this new alkali in its place. Their example was followed by the manufactures of plate glass, and before long, the employment of the old crude alkali was discontinued also in the preparation of blown window glass, and an improved quality and colour was the result.

The alkali thus substituted was the carbonate of soda of commerce, containing, besides carbonate, a considerable portion of undecomposed sulphate. The further improvement which followed, viz., the substitution of simple sulphate of soda for this carbonate of commerce, was due to the researches of the celebrated Gehlen; but some time elapsed before his ideas were carried out in Germany, and it was not until 1825 that the manufacturers of France, released, through the exertions of M. Clement Desormes, from the absurd veto which the government had pronounced on the sale of sulphate of soda, were enabled to turn their attention to the employment of this cheaper article. They proceeded with caution in the introduction of this new ingredient, first mixing a small quantity of sulphate of soda with a large proportion of carbonate, then half of each, and finally, excluding carbonate, they adopted the sole use of sulphate, to the injury doubtless of the colour of their glass, but gainers by the employment of a cheaper and more manageable material. Where colour, however, is an object, as in the manufacture of plate glass, the exclusive use of carbonate of soda is still retained.

The introduction of carbonate of soda, prepared from salt, into the glass manufacture of England, dates from the year 1831. Proceeding cautiously in the steps of their foreign brethren, the English glass makers, after they had established the use of carbonate, made trial of the effect of a small quantity of sulphate of soda in a large quantity of carbonate. The carbonate gradually decreased, until at length, in the preparation of blown window glass, sulphate stood alone. But here, as abroad, the manufacturers of plate glass still adhere to the carbonate.

As the use, whether of carbonate or sulphate of soda, involves their preparation from common salt and sulphuric acid, attempts have been made to accomplish the direct union of silica and salt, in the manufacture of window glass, but have hitherto failed of success. The black bottles of Newcastle are made from common rock salt and sand from the bed of the river, with the carbonate of lime of the soap works, and the tank waste of the alkali makers, but for all better kinds of glass, the circuitous combination of silica and alkali is still found necessary.

The third element in the composition of this glass is lime, which may be introduced as lime, chalk, or limestone. This renders, as I have stated, the alkaline silicate insoluble, and when rightly balanced by the other ingredients, promotes the fusion of the whole, and improves the quality, but when added in excess, the glass becomes hard and difficult to work, and subject to devitrification.

The three sources, then, from which we obtain silica, soda, and lime, the three great elements of window glass, are sand, salt, and chalk or limestone, and of these nature has provided an exhaustless supply.

But besides these, several other ingredients, in much smaller quantities, enter into the composition of this glass. Alumina is sometimes purposely introduced, and is always accidentally present, brought there by the action of the materials upon the clay of the pots in which they are melted. Alumina, if present in any quantity, is always an undesirable element, as, by increasing the number of silicates, it renders the glass more liable to devitrification, it being well known that the more compound a glass is, the more does it display this tendency. Bottle glass, which contains a greater variety of bases than any other, is of all the most easily devitrified.

Another and an unwelcome element is iron, which is almost always present in the sand, sulphate of soda, and chalk, partly in the state of protoxide, the colourising effect of which is partially destroyed by the introduction of manganese, the peroxide of manganese, and the protoxide of iron, each possessing colouring properties, but by their mutual action rendering each other comparatively harmless. The effect of manganese is, however, much interfered with by the carbon, which is necessarily introduced to decompose the sulphate of soda. This carbon, subtracting oxygen from the manganese, prevents its action on the iron.

A little arsenic promotes the decomposition of the other ingredients, and tends to dissipate carbonaceous impurities not otherwise disposed of, but, in excess, it produces a milkiness in the glass, which time will increase.

Lastly, to this farrago of sand, soda, chalk, charcoal, arsenic, and manganese, we add what is abundantly produced in every manufactory of glass, a quantity of waste glass, or cullet, which, being more fusible than the raw materials, facilitates the melting.

The ingredients are mixed in much the same proportions either for crown or sheet glass, with the exception of the lime, of which the nature of the crown glass manipulation requires a smaller quantity.

To lay down any standard proportions is almost impossible, as no two manufacturers use the same, and even in the same works the melting powers of the furnaces may so far differ as to render necessary, for the production of the same glass, variations in the proportions of its elements.

The ingredients, having been thoroughly incorporated together, are, without further preparation, introduced into the pots in which they are to be melted. During the period to which I have referred, when barilla, kelp, and other forms of crude alkali were in use, it was the custom to subject the materials to the preliminary operation of "fritting," or stirring them together under the heat of a reverberatory furnace, thereby effecting partial decomposition, and burning off any carbonaceous inpurities, but the introduction of alkali prepared from salt has removed the necessity of this treatment.

The pots are made of the best Stourbridge clay, mixed with about one-fifth of ground potsherds, and are distinguished from flint glass pots by their greater size, and by the absence of any hood or cover to protect their contents from the fire. Their size has been of late years considerably increased, both in width and height, and a pot whose dimensions would, a few years since, have excited wonder, is now in ordinary use.

These pots are made entirely by hand, no machinery having as yet been invented that can replace that process, slow but sure, by which, bit by bit, the pot is built up. A good pot-maker, with two assistants, can furnish three or four per week. After a careful drying of many months, they are made ready for the furnace by a previous heating in a kiln or pot arch. Here a small lump of coal, thrown against its side, tests the soundness of the pot. If, when struck, it rings well, its future is promising; but if it returns a dull sound, it will, probably be short-lived in the furnace, though now and then such a pot will disappoint the bad opinions formed of it, and turn out a respectable pot after all.

The terrible task of setting these pots in the furnace falls upon the glass-house crew, and the nicety with which these enormous vessels are adjusted in their place, in the teeth of a consuming fire, is, perhaps, that operation which in the many marvels of glass-making would most astonish a stranger to such scenes.

The average duration of the pots when thus fixed is about seven weeks. Some attain the age of ten or twelve, while others, as every manufacturer well knows, terminate their existence prematurely, either from the naturally defective constitution of the pot, or from bad treatment in the pot arch, or more frequently from its having been "starved," exposed, that is, to a current of cold air, in the furnace, through the neglect of the attendant. "Misfortunes never come singly," is an adage applicable to the catastrophes of pots. It was truly remarked to a manufacturer, at a period when such calamaties were frequent, "Your pots break, because they break."

The breakage of a pot often disturbs the furnace to such an extent, that the breakage of others frequently follows, and many weeks will sometimes elapse before the disorganisation thus produced can be rectified. The loss of the pot and the "metal" contained, is nothing as compared with the injury which the glass in the surviving pots, and these pots themselves, are apt to sustain.

My limits compel me to forego any description of the furnace in which the pots are placed, or of the process by which the materials are transformed from their primary condition into a molten vitreous mass. Assuming, then, that our pots are full of melted glass, let us take a brief survey of the two methods by which this glass may be brought into the required form.

Crown glass, as the older of the two in this country, must first claim our attention. Upon the surface of the melted glass is a ring of fire-clay, which, when the materials were thrown in, lay at the bottom of the pot, and after the completion of the melting found its way upwards. This ring is of great service, for, floating in the centre of the pot, it prevents the exterior surface of the metal, or melted glass, which becomes stiff and stringy during the long period of working, from mingling with the interior or hotter surface, which thus remains throughout of a suitable consistency. The labour also of the skimmer, whose duty it is to clear the surface of the metal from any scum or dirt that may collect upon it, is considerably diminished by the ring, which, limiting the space from which the glass is drawn, limits also the space which it is necessary to cleanse, and any bubbles or impurities in the glass have a tendency to attach themselves to the ring.

The metal, or melted glass, having been brought by the gradual cooling of the furnace from a state of complete fluidity to a consistence capable of being worked, the gatherer dips the end of his pipe, or hollow rod of iron, into the pot inside the ring, and twirling it round its axis to equalise the thickness of the gathering, he collects upon the end, or nose, as it is technically called, a pear-shaped lump of glass. Resting his pipe upon a stand or horse he turns it gently round, and allows the surface of the lump to cool, to fit it for a second gathering. The lump completed, the gatherer having cooled his pipe under a trough of water, that he may handle it at any point, proceeds to roll the glass upon a marver, or metallic bed, until it assumes a conical form, the apex of the cone forming the "bullion point." A boy now blows down the pipe while it is still being turned by the gatherer on the marver, and expands the glass into a small globe. Having been heated it is blown again, and assumes the shape of a Florence flask, and the future rim of the developed plate is prepared by rolling the piece, near the pipe nose, upon the edge of a marver. Again heated, it is now expanded by the blower into a large globe. During this expansion, it is important to keep the bullion point exactly in the position which it previously occupied, in a line with the axis of the pipe. To effect this, the blower rests his pipe upon an iron support, and while he blows down the pipe and turns it round at the same time, a boy holds against the bullion point a piece of iron terminating in a small cup. Again presented to the fire, by the peculiar manipulation of the workman and the peculiar direction of the flame upon it, the front of the globe is flattened, the possibility of the globe collapsing during this operation being prevented by its rapid revolution round its axis. The piece now resembles somewhat in shape an enormous decanter, with a very flat bottom and a very short neck. The bullion point is still to be seen in the centre of the flat bottom, and its use now becomes manifest. The pipe is laid horizontally upon an iron rest, and a man approaches having in his hand a large rod of iron called a ponty, tipped with a lump of molten glass. Pressing this lump upon an iron point, so as to give it the form of a little cup, he fits it, when thus shaped, on to the bullion point, to which it soon becomes firmly attached. The lump thus formed is called the bull's eye, or bullion of the developed plate. The incision of a piece of cold iron in the glass round the nose of the pipe, and a smart blow, soon detaches the pipe, which here takes leave of the piece, and after having lain idle a few minutes, till the glass adhering to it has cracked off, it is warmed, and carried back to the pot to repeat its course.

The end of the piece, which was next the now detached pipe, is called the nose, and gives its name to the furnace or nosehole where this nose is, on account of its thickness, heated almost to melting, with a view to the coming operation. The glass now undergoes its last and most dreadful torture in the hands of a man who, with a veil before his face, stands in front of a huge circle of flame, into which he thrusts his piece, rapidly meanwhile revolving his ponty. The action of heat and centrifugal force combined is soon visible. The nose of the piece expands, the parts round cannot resist the tendency—the opening grows larger and larger—for a moment is caught a glimpse of a circle with a double rim; the next moment, before the eyes of the astonished spectator, is whirling a thin transparent circular plate of glass, which, but a few minutes before, was lying in the glass-pot, an undistinguishable portion of the molten mass. Still whirling, the table, as it is now called, is carried off, laid flat upon a support called a whimsey, detached by shears from the ponty, lifted into the annealing kiln upon a fork, and piled upon its edge against the preceding table. The weight of so many tables pressing one against another would cause the hindermost to bend, but this is prevented by the intervention of iron frames or drossers, which divide the tables into sets, the first drosser leaning against the wall of the kiln, the second against the first and so on, and thus rendering each set of tables independent of those behind it for support. As the bull's eye or centre lump, which the ponty has left behind it, keeps each table from close contact with its neighbours, the air passes freely between them, and the annealing is accomplished with tolerable rapidity, varying from twenty-four to forty-eight hours, according to the number of tables in the kiln. From the kiln the tables are conveyed to the warehouse, having passed, since their first exit from the pot, through the hands of ten distinct workmen.

The above brief and vague description of a marvellous process will, I trust, be intelligible to those who have themselves seen it; to those who have not seen it, no description, however elaborate, no diagrams, however clear, can convey any idea of the perpetual change of form, size, and appearance which the glass exhibits during its growth.

The process may be regarded as twofold—first, the development of the lump into a sphere, and, secondly, the resolution of a sphere into a circular table. Constant rotation of the glass, while in a yielding state, is an essential element of this process, as if allowed to remain motionless, its symmetry would be immediately destroyed.

A table of crown-glass of to-day, would scarcely recognise as of kindred origin a table of the earlier part of the present century. The principle of the process in each case was the same; it is the improvement of minute details that produces so different a result. To Mr. Hartley and Mr. Chance, who, during the years 1832 to 1836, gave to the manufacture of this glass their constant attention, is owing, in a great measure, its present status.

When the tables of crown-glass are drawn from the kiln, they are covered with a whitish film or "hum." The history of this "hum" is curious. It arose probably, in the first instance, from the deposition of sulphur from the fuel upon the surface of the glass. It thus became associated with the process of annealing, and buyers fancied that the more "hum" there was upon the glass, the better was the glass annealed. The manufacturers of crown-glass, ever ready to accommodate themselves to the fancies of their customers, have taken the trouble to produce an additional "hum" by the introduction of sulphur in the kiln. The members, however, of the Glass Jury of the Paris Exhibition, not being in the secret of this hum, stoutly maintained that glass thus clouded must be bad glass, and that the hum was owing to the exudation of the alkali.

In the warehouse, the tables are laid upon a "nest," or cushion, and are divided by the diamond of the splitter into two unequal parts,—the larger half containing the "bull's-eye." The diameter of the table is measured on the nest, the usual size being now about 54 inches, and weighing 13 lbs. Tables have been made as wide as 70 inches, but the difficulty of manipulation, and the uncertainty of the result, render such sizes too costly to be general.

The splitter carefully examines each table before splitting it, and turns it round till he has brought it into the position in which he may split it to the best advantage, announcing at the same time its quality. The first quality is called "best"—*rara avis in terris*—the next, seconds—then thirds—fourths—CC—CCC or Irish—and tables containing any very glaring defects, come under the denomination of "coarse."

These variations in quality depend on the presence or absence, number, and extent of those defects to which, even in the best regulated manufactories, glass is unavoidably liable. Perhaps the glass has been badly melted, and is seedy, full, (that is) of little vesicles, to which the rotary motion has given a circular shape. Or the gatherer may have enclosed air within his "metal," and a gatherer's blister is the result—or a pipe blister, or pipe-scales, or dust from the pipe-nose, or dust from the marver, or dust from the bottoming-hole, or dust from the nose-hole, or dust from the flashing-furnace, or bad bullions, or scratches, or music lines, may disfigure the table, or the glass may be crizzled, or curved, or bent, or hard, or smoky, or small and light, defects to explain which, would be a long and dreary task. No wonder that tables of the best quality are few and far between, in some manufactories a forlorn hope never to be realized.

The difficulty of obtaining glass free from defects will account for what may at first astonish,—the fact that the value of a table of the highest quality is three times that of the lowest.

The defects enumerated, many as they are, are instantly detected, even through the obscuring hum, by the splitter, who not only can descry faults invisible to ordinary eyes, but can refer each fault to a particular stage of the process, and to a particular cause in that particular stage, and the faults are registered accordingly. The nomenclature of defects is much facilitated by the mapping out of the table into certain ideal divisions, derived from shapes assumed during various periods of the process. The centre lump is termed the bullion; round this lies the bottom; next the bulge; the shoulder; the top, and the rim, or the outermost edge of the circle.

Independently, however, of these defects, there are certain other disadvantages under which even a faultless table of crown-glass must unavoidably labour. The cutting of a circle into rectangular sheets, must necessarily be attended with waste, while the bull's-eye confines those sheets to comparatively small sizes. Uniformity of thickness, also, except by the most skilful manipulation, is difficult of attainment. Wavy lines, termed music lines, forming a series of concentric circles round the bull's-eye, and owing to the treatment of the glass upon the marver, were formerly a common defect; but improvements in the process have in a great measure removed them.

On the other hand, extreme brilliancy of surface is a distinguishing characteristic of this glass, ascribed by some to the influence of the marver, by others to the effect of the flashing-furnace.

It is this brilliancy of surface which has enabled crown glass to maintain in England its position against that formidable rival of which I must now briefly speak.

Imagine, as before, a lump of glass collected upon the end of the gatherer's pipe. For the metallic table or marver is now substituted a block of wood, so hollowed out as to allow the lump, when placed upon it, to be expanded by the blower to the diameter ultimately required. The block, during this operation, is sprinkled with water, to prevent the wood from being burnt, and from scratching the glass. From the block it is carried to the blowing furnace, which is accessible through a number of holes or openings, each hole been allotted to a single blower. In front of the furnace corresponding to each opening, is a stage or frame of wood, erected over a large pit or well about ten-feet deep, and these parallel stages are sufficiently apart to enable each blower to swing his pipe to and fro in a vertical plane, that the glass may run freely out, as the phrase is, to the required length. When the glass has been sufficiently heated in the blowing furnace, it is brought out, and swung round in a vertical plane, and also backwards and forwards, and the blower, at the same time, by blowing down the pipe, constantly keeps the lengthening cylinder full of air.

Uniformity of substance and of diameter is chiefly secured by the skill of the workman, who, when he finds the metal running out too freely, holds the cylinder vertically above his head, still keeping it well filled with air. These operations are continued until the cylinder has reached the length required. The diameter of the cylinder was determined by the wooden block, and remains the same throughout.

The next stage of the process is opening the end of the cylinder. The thinner kinds of glass are all opened by submitting the end of the cylinder to the fire, and at the same time forcing in air through the pipe and stopping up its aperture. The air is expanded by the heat of the fire, and bursts open the cylinder at the end, this being the hottest and most yielding part. The aperture thus made is widened out to the diameter of the cylinder, by subsequently turning the cylinder to and fro with the opening downwards.

The thicker kinds are opened by attaching a lump of hot glass to the end of the cylinder, which thus becomes the hottest and weakest part, and the air forced in by the blower as before bursts it open. The opening is then enlarged by cutting round it with scissors. If opened in the furnace, as in the first case, the ends of the thicker cylinders would be so thinned out that a considerable portion would be wasted.

The cylinder is now laid on a wooden rest, or "chevalet," and is easily detached from the pipe by the application of a piece of cold iron or steel to the neck of the glass near the pipe-nose; the neck being hot suddenly contracts externally and breaks away from the cylinder. There still remains the cap or end of the cylinder, which is easily taken off by wrapping round the end of the cylinder a thread of hot glass, removing the thread and applying a piece of cold iron to any point which the thread covered.

On the Continent, the operation of heating the glass cylinder is performed in the apertures of the melting furnace; but the obvious advantage of a separate furnace has induced, I believe, one French manufacturer to adopt the English plan, and others will, probably follow his example.

The cylinder, as it now lies upon the chevalet, is little more in weight than two-thirds of the lump of glass which the gatherer collected on his pipe. The quantity left upon the pipe nose, with that which formed the cap of the cylinder, are nearly equivalent in weight to one half the cylinder.

The finished cylinder is now split open by a diamond, which, attached to a long handle, and guided by a wooden rule, is drawn along the inside length of the cylinder, and should pass through or in the neighbourhood of some notable defect or group of defects, if such be present, for defects thus brought to the edges of the subsequent plate of glass are of lessened injury to its value. An object to be avoided is the black mark which the cylinder sometimes receives from the charring of the wooden "chevalet," on which, while hot, it rested in the glass-house. If the diamond passes, inside the cylinder, over the space occupied by this mark upon the outside, the cylinder will fly to pieces. The reason of this is not difficult to understand. The chevalet prevented, by its non-conducting tendency, that portion of the glass with which it was in contact, from cooling equably with the rest, and the particles at that point remained in a state of tension. A careful blower will never place any large defect in his cylinder in contact with the chevalet, being aware of the probable result.

The use of the diamond in dividing plain surfaces of glass, dates from the sixteenth century; but its application to the splitting of cylinders which had not undergone the process of annealing, was introduced not more than twenty years ago, by M. Claudet. Previously, all such cylinders were split by a red-hot iron, and, even now, all cylinders of flashed glass, that is, of ordinary sheet glass covered inside with a skin of coloured, are still split in the same fashion.

On the Continent, I believe, the diamond is gradually replacing the use of red-hot iron, though the latter is still the method more generally practised.

The cylinder is now ready for the flattener, who, having prepared it by a preliminary warming in the flue, by which it is introduced into his furnace, passes it, by means of a croppie, or iron instrument, on to the flattening stone, from the slight irregularities of whose surface it is protected by a lagre, or sheet of glass, laid upon the stone. Upon this lagre the cylinder, lying with the split uppermost, is soon opened by the flame passing over it, and falls back into a wavy sheet. The flattener now applies another instrument, a polissoir, or rod of iron, furnished at the end with a block of wood, and rubs down the waviness into a flat surface, often, upon a refractory piece, using considerable force. Some cylinders are so distorted in the blowing, that no rubbing can flatten them, but all, good, bad, and indifferent, pass through the same treatment. The flattening stone is now moved on wheels to a cooler portion of the furnace, and by the aid of the flattening fork, delivers its sheet to another stone, called the cooling stone. From this, when sufficiently stiff, it is again lifted, and then piled generally on its edge, in order to be annealed.

Very different, both in process and result, was the manufacture of spread, or German cylinder glass, which preceded the introduction into England of the French system. The cylinder, unskilfully blown, was cut open while hot with a pair of shears, and spread out immediately upon a plate of iron, covered with sand. The thickness of this glass was very irregular, and its surface very coarse.

To return to our flattened sheets. The sheets, when annealed, are drawn from the kiln and carried to the warehouse, where they undergo examination.

Sheet glass, blown by a less complex process than crown, is liable in the glass-house to a less number of defects, but the after process of flattening often makes up the deficiency; and the manner in which a sheet, spared by one process, is disfigured by another, is sometimes curiously provoking. Standing before the table of the "assorter," your eye lights upon a piece which, blown under an evil star, has imbibed in the glass-house every possible defect. The founder, skimmer, gatherer, and blower, have all stamped their brand upon it. It is seedy,—the vesicles, which were in the crown tables rounded by the rotary motion of the piece, here elongated by the extension of the cylinder; it is stony, disfigured with stony droppings from the furnace; stringy, thin threads of glass meandering over its surface; "ambitty," covered with stony speckles, symptoms of incipient devitrification; conspicuous with gatherers' blisters and blisters from the pipe—badly gathered; badly blown—thin here, thick there, and grooved with a row of scratches; and on this abortion the flattener chances to have exerted his most exquisite skill; it has passed through his hands unscathed, flat as a polished mirror, yet, from its previous defects, entirely worthless. Next comes before you a piece whose beginning was miraculous,—no seed, no blisters; it prospered under the hands of the gatherer and blower, and left the glass-house a perfect cylinder. But the croppie of the flattener marked it; the fire scalded it; dust fell upon the lagre, and dirtied it; scraps from the edges of the preceding cylinder stayed upon the lagre, and stuck to it; the stone scratched it; and the heat of the annealing chamber bent it. Such are the difficulties to which every cylinder is subject—those of the glass-house, and those of the flattening-kiln. Not all, however, are such as these,—there are good as well as bad, but the good are generally in the minority.

The qualities range thus—best, seconds, thirds, fourths, and H, the latter standing for horticultural, and including all coarse glass, such as may be applied to horticultural purposes. The difficulty of escape from defects renders the best quality, as in crown-glass, three times as costly as the common. The expense of production to the manufacturer is in each case the same; the materials, the labour, the fuel, the same for each. Success, therefore clearly hinges on the proportion of good glass which a manufacturer can obtain. The six qualities of sheet-glass may each consist of six different thicknesses, forming thus, in all, thirty-six varieties.

When this manufacture was new in England, the size usually blown was 36 inches long, and 20 wide. The usual size now is 47 inches long by 32 wide, and cylinders are occasionally blown 77 inches long, but large sizes and heavy weights are accomplished only by workmen of the first class. A sheet of this latter size, containing twenty-one ounces to the foot, would require for its formation a lump of glass upon the gatherer's pipe, of no less than 38 lbs. weight.

The size which sheet-glass can thus reach, is obviously a great advantage, and adapts it to many purposes from which the limited dimensions of crown are excluded. It was this glass that covered the Great Exhibition in 1851. A cylinder was blown to cut, as the phrase is, 49 inches by 30; this was sub-divided into three panes of 49 inches by ten. About 300,000 of these, extending over a million square feet, and weighing upwards of 400 tons, were the work of a few weeks, and this without absorbing or disturbing the ordinary produce of the manufacturer. The energy of the glaziers was equal to their task; 18,392 panes were fixed in the roof in one week, by 80 men, 108 panes being accomplished by one man in a single day.

But sheet-glass has its faults as well as its virtues; it is devoid of that brilliancy of surface for which crown is so remarkable. It is subject, also, to undulations on the surface, the precise origin of which it is difficult to explain. Mr. Shaw, in his admirable lecture on the glass manufacture, as illustrated by the Great Exhibition, speaking of this defect, says, " When the divided cylinder is softened by heat, and either allowed to flatten by its own weight, or flattened by the workmen, the concave interior of the cylinder has to expand, and the convex exterior to contract, as the curved surface becomes plane. Were this contraction and expansion to take place uniformly throughout the glass, the undulation in question would not occur, but since one part invariably yields somewhat more readily than another, perfect flatness cannot be attained."

It is, however, more probable that this undulation is produced in the operation of blowing, and is due to the double movement of the particles of glass which accompanies the formation of every cylinder, the one movement being parallel to the axis of the cylinder, and the other in planes at right angles to that axis.

Having thus briefly described the two distinct processes which converge in one result, a sheet of window glass, I shall now notice the circumstances under which these two processes have attained their present position, and I shall here avail myself of the valuable information which M. Bontemps has provided.

We have no evidence whatever by which to determine the relative antiquity of these two processes. The cylindrical process is the only one mentioned by Theophilus in the 13th century, and this method was adopted by the Venetians, as the more uniform thickness which resulted from it insured, in their coloured glasses, a greater uniformity of colour. But in France, England, and the North of Germany, the cylindrical process fell gradually into disuse, as the demand for coloured glass diminished, and at length in these countries the rotary principle exclusively prevailed, but it was so imperfectly carried out, that the tables seldom exceeded thirty inches in diameter, and were of very variable thickness.

Bohemia, however, still retained the cylindrical process which she had learnt from Venice, and with such success that when the French were in need of large and good glass they imported it from Bohemia.

Thus it was until the commencement of the eighteenth century. Then a French officer, M. Drolenvaux, formed the project of introducing the Bohemian method into France. He constructed a company, brought workmen from Bohemia, and establishd a manufactory at Lettenbach, in 1730, with great success.

From this resulted in France, Belgium, and the North of Holland, where the style of building required panes of large size, the abandonment of the rotary principle and the adoption of the cylindrical, and towards the close of the last century a manufactory near Abbeville, in Normandy, one in Hanover, and two others near Bamberg and Aschaffenburgh, were the last in which the rotary method was employed.

The last of these, that near Aschaffenburgh, was visited by a glass manufacturer, in 1844, and he was much surprised at the very slow and unsystematic manner of proceeding which prevailed there. The gatherers held in their mouths a piece of pasteboard, turned up so as to protect their faces. The nose of the glass, after it had left the pipe and was attached to the ponty, was helped open with a piece of wood, and, after the table had been formed, it was laid upon a bed of small coal or coke and the ponty detached. The table was then piled in the annealing kiln.

In England, the manufacture of crown glass maintained its position, notwithstanding its abandonment abroad, and attained to such superiority over the spread or broad glass, to the rudeness of which I have alluded, that the former was used for all houses of the better class, while the latter was confined to poorer dwellings.

The inferiority of this spread glass, manufactured on the German principle, but by no means so good as the German glass, tended to prejudice the public against all glass manufactured on the cylindrical principle. This prejudice was, however, gradually overcome by the establishment in England of the manufacture of cylindrical glass, according to the process which I have already detailed, introduced from France, and from which resulted a glass which entirely displaced the manufacture of spread glass.

The introduction of this new manufacture was due to Mr. Chance and Mr. Hartley, who, on visiting, in 1830, the works of M. Bontemps, near Paris, were much struck with the advantages of the glass made on this principle, and, having secured the co-operation of M. Bontemps, they commenced the process at their own works in the autumn of 1832. So great, however, were the difficulties to be overcome, that it was not till 1838 that the manufacture of this glass was completely established. Since that time there has been great progress; and the sheet glass now manufactured in this country, though inferior in colour, is in other points generally superior to that of the foreign teachers.

A further development of the sheet glass manufacture in England, was the process of grinding and polishing this glass by machinery, whereby a new branch of manufacture was established, which has furnished glass peculiarly applicable for purposes for which none previously existed.

A fitting companion for this, though not within the limits of blown window glass, is the remarkable invention of Mr. Hartley, by which glass, conveyed directly from the glass pot to a table, is rolled into sheets without employing in each operation more glass than is wanted for each plate of glass, however small it may be. This glass is admirably adapted for those purposes in which translucency only is required.

The greatest stimulus, however, that has been given to the crown and sheet glass manufacture was, the abolition of the duty in 1845. That abolition has produced a somewhat paradoxical result. While the quantity of glass made has increased in the proportion of three to one, the number of manufacturing firms has diminished in the proportion of one to two. In 1844 there were fourteen companies engaged in the manufacture. In 1846 and 1847, following the repeal of the duty, the number had increased to twenty-four. The glass trade, after the removal of the heavy burden imposed upon it, seemed to offer a fair opening for money seeking investment. The demand for glass was so great that the manufacturers were in despair. Glass-houses sprang up like mushrooms. Joint-stock companies were established to satisfy the universal craving for window panes. And what was the result? Of the four-and-twenty companies existing in the year 1847, there were left, in 1854, but ten. At this time there are but seven in the whole United Kingdom. Two, established in Ireland, have ceased to exist. In Scotland, the Dumbarton Works, once famous, were closed, in 1831, by the death of the partners, afterwards reopened, and again closed. The seven now existing are all English.

I turn, in conclusion, from this somewhat melancholy picture to a more cheering subject, the great ends which, from small beginnings, this manufacture has accomplished. The glazier of Pompeii little dreamt that the time would come when the substance that he handled, then so rare, would minister through the world to the health and pleasure of mankind; that beneath it trees would flourish, transported from a foreign soil; and that, cheaper than wood itself, it would combine with iron to form the largest building on the earth. But from Pompeii to the Crystal Palace there has been a progress of nearly twenty centuries, and a still greater progress in action than in time. That progress has been marked by no sudden revolutions, such as have distinguished the development of other efforts of mankind. The problem of blowing glass into a sheet admits of limited solutions, a cylinder or a sphere, Through one or other of these forms the first blown sheet cannot but have passed, and through one or other all pass now. But the progress has been none the less for lack of revolutionising discoveries. Minute and apparently unimportant changes, perceptible only to those near at hand, have in silence done their work.

Still, the development both of its processes and its applications is incomplete. Sir Joseph Paxton's glass arcade, stretching over the streets of London, and Dr. Sleigh's city of glass, in which invalids will inhale the gentle air of Madeira,—these are faint foreshadowings of the destiny of this wonderful substance.

And, perhaps, the day may come when some future chronicler of glass shall smile at the barbarians of the nineteenth century, who could not make window glass without defects, and shall exhibit those defects as the curiosities of a byegone age.

DISCUSSION.

The **Chairman** said, all who had heard the paper read would agree that there was a vivacity in its style which must have rendered it pleasing even to those who did not comprehend the subject on which it treated, while, on the other hand, those conversant with the subject would give the writer credit for the talent which he had displayed. As there were many gentlemen in the room fully conversant with the manufacture in all its details, he hoped they would favour the meeting with a few remarks.

Mr. **Wilson** was sorry that the chairman had called on him to make some observations on the paper just read, before any one else, because he was connected only with the plate-glass making, not the crown and sheet. He would observe, however, that as the paper mentioned that the "trade" fancied that the glass was better finished or annealed if it had a scum or film on it, which the makers called by the appropriate name of "hum," and that a little sulphur was thrown into the annealing oven to give that appearance, so the public should take care that they were not taken in by first appearances. Mr. Wilson did not agree that the French plate glass was superior, or that the Fontainebleau sand was the cause of its greater brilliancy of colour. He had no hesitation in saying that if glass could be made "white," without the use of materials which destroyed its brilliancy, and in other respects spoiled the glass, it would be the perfect colour. But the French glass had a dead, leaden appearance and a dampness on it, which latter he attributed to an excess of alkali, tending to devitrification. Proof of this might be seen if glasses were kept together for any length of time. They were then scarcely to be separated, owing to the damp which exuded. In the United States the effect of climate had also an action on glass, proving further that such was the fact. There was no doubt that the glass made with the common sulphate of soda was as bad as plate glass, from its green colour; but the attempt to reduce the pale blue was attended with extraordinary effects. Mr. Wilson produced a sample of plate glass, originally white, showing that where exposed (part had been covered by ornamental wood work) it had changed to purple. This was from the use of manganese. Another specimen had changed to a gold colour. Referring to the notice taken of the cockle or wavy appearance of the sheet glass, Mr. Wilson attributed it to the contraction and expansion of the metal in cooling. The cast plate glass, before being ground and polished, although a roller of immense weight passed over it whilst in the molten state, showed, on the table side, a roughness, which he attributed to that cause, and on the upper or roller side, presented just the appearance referred to in the sheet glass. Mr. Wilson concluded by regretting that, although the repeal of the duty had caused such improvement and extension of demand, yet it had required such a concentration of capital that the number of manufacturers had been reduced, as mentioned in Mr. Chance's paper.

Mr. W. A. **Swinburne** said, as one of the unfortunate seven manufacturers alluded to in the paper just read, and being connected with the oldest house in the trade, he should like to make a few remarks. After bearing testimony to the general correctness of Mr. H. Chance's communication, and regretting the cause of his absence, Mr. Swinburne stated, with respect to kelp, that he had been one of the first to endeavour to substitute a factitious material, in the manufacture of crown glass, for this very rude and uncertain natural product. By analysing kelp, and using its component parts, he had at last introduced the use of artificial substitutes for kelp. He also mentioned the patent of Mr. Attwood for using the kelp ash, and rejecting the soluble parts, as a step towards the use of a better material. With respect to the "hum," commented on by Mr. Wilson, he did not believe it was at all a necessary symptom of good glass, and he never heard of sulphur being used as described by Mr. H. Chance; at all events he had never so used it himself. As to the superior brilliancy of crown glass, he did not believe that it was produced by the marver, but by the simple effect of heat. He thought this surface, or "skin," as it was technically termed, was simply the fire polish that all glass assumes when exposed to strong heat, and not afterwards affected by any disturbing cause. He begged to supply an omission in the paper just read, which the modesty of the writer possibly prevented his doing. It was the house of Chance and Company which had executed the large order for the 1851 Exhibition without materially affecting their power of executing their general orders, a feat unparalleled in the history of the manufactures of this country, and which, as a rival manufacturer, he had much pleasure in mentioning. There was one article which Mr. Chance had omitted to notice, and which he considered came under the head of "blown window glass," and that was blown plate glass. Perhaps it was not generally known, that originally, all plate glass was made in this country by the process of blowing, and that it was not till 1773 that the British Plate Glass Company first began to make plate glass by casting. Mr. Swinburne described the process as being very similar in principle to that of sheet glass, only differing in some mechanical contrivances to assist the workmen in handling so much heavier a piece of glass. He then alluded to the different price of glass in former times, as compared with the present, speaking of 3s. 6d. or 4s. a foot as having been paid to glaziers now living for glazing ordinary size crown glass in sashes, for which now, perhaps, only as many pence could be obtained. In the case of plate glass, he held in his hand a tariff used by their house, dated 1771, two years before the establishment of the British Plate Glass Company, wherein the price of a chimney mirror 50 inches long by 40 inches wide, a very usual size, and now in common demand, was quoted at £61 3s.! The price of this plate before the repeal of the duty in 1845, was from £9 9s. to £10; after the repeal of the duty, about £8; a year ago, £4 10s.; and now, he was sorry to say, about £4 4s. So much had the public benefited by the reduction of the price of glass.

Mr. F. **Pellatt** proceeded to remark upon two points in the paper, which he described as the most interesting and important to the glassmaker, viz., colour and annealing. He described all glass as being tinted by some colour, either from the presence of impurities in the materials, or the result of deoxidation of the materials (were they chemically pure) in melting. The impurity present in most glass was iron, in the state of the protoxide, which imparted a green colour. To neutralise this the oxide of manganese was used, the effect being to change the green to a brownish yellow colour. This was not obtained by the pink colour of the manganese being antagonistic to the green, and thus subduing it, but by the iron taking another charge of oxygen from the manganese, and so becoming the peroxide of iron, the colour of which was a reddish yellow, whilst the protoxide was green. He was of opinion that all colour was due to the presence of oxygen or carbon in combination with that metallic base of the glass having the greatest affinity for either of these. The reason of manganese being used to de-colour glass was, that it was a metallic base, having the strongest affinity for oxygen, giving it off but very slowly to other bases, and that, during the process of the glass founding, it prevented carbonisation by gradually supplying oxygen. That the colour of the oxide of manganese was due to the oxygen, was readily proved, by thrusting a green stick into a pot of glass made with manganese, the colour of which was purple. The purple would shortly disappear, and a green would take its place, solely from the abstraction of oxygen. Changes in the colour of glass, from exposure to light or heat, might be accounted for upon the same principle. In alluding to annealing he explained that, in cooling, glass contracted, following the law of all other substances, and as bodies in expanding absorbed caloric, so glass in cooling parted with latent caloric, and in so doing a more minute arrangement of atoms took place. The object of annealing was to keep the surface of the glass in the same atomic condition as the interior, allowing a gradual and slow arrangement of atoms during the evolution of the caloric. Though not quite connected with the subject under discussion, Mr. F. Pellatt would ask the permission of the meeting that he might explain how a roller and a cylinder of glass, turned and bored perfectly true, which were exhibited, were produced. They were made under Chedgey's patent, the glass being poured direct from the pot into the moulds. When cylinders were required, the core, which was of iron, was hollow, and the glass was prevented from sticking to the core by a stream of water passing through it while the casting was being made. Thus, pipes for the conveyance of water, acids, and other fluids which act upon metal, might be readily and cheaply made. It might easily be understood what an advantage glass rollers would be in the manufacture of paper, or wherever the machinery was exposed to acids or damp; besides which, a surface was given to fabrics by glass, which the finest polished metal could not produce. It was expected that these rollers and cylinders might be produced at a very moderate cost, and be made of glass of such hardness as to equal the finest steel.

Mr. Claudet, F.R.S., begged permission to read the following notes, which he had prepared on the subject under discussion:—

"We are all much indebted to Mr. H. Chance for his valuable, clear, and well-written paper on the manufacture of the various kinds of window glass, one of the most useful and beautiful productions of human industry. Really, when we consider that our dwelling-houses are partly made of that material which protects us from the inclemency of the season, without stopping a ray of the light that renders them cheerful and comfortable, it is difficult to understand how men in our climate could have lived and been happy in ages when glass was unknown. The fact is, without glass, civilisation could never, in northern latitudes, have attained the state of perfection which we enjoy. How could science, art, and manufacture, have flourished in these countries if our houses had been deprived of glass; therefore, we may say, that glass is one of the causes of the progress of mankind.

"Mr. H. Chance has truly observed that the development, both of its processes and its applications, is incomplete, adding, that future ages may smile at the barbarians of the 19th century who could not make window glass without defects. I think that future ages will have more reason to smile at the barbarians who, having the means of obtaining so easily such perfect glass, at so low a cost, used it so sparingly. A time will come when every house, without the least additional expense, nay, with a great saving in its construction, will be supplied with a conservatory on its roof, where children and invalids, in cold and damp weather, will enjoy the genial effects of light in the midst of plants and flowers, from whence we may see the first and the last rays of the sun during the short days of the year.

"Having begun my career as a glass manufacturer, and my lot being to finish it as a photographer, I have been connected with two arts singularly similar in various points, in both of which one might equally find full employment for all the resources of one's mind and activity, and the difficulties of which seem of the same uncertain character, for, as Mr. H. Chance observes, with the greatest skill, care, and attention, the manufacturer of glass is never sure of success; so it is in photography. The reason of this is, that both arts are dependent on so many physical and chemical causes, that it is impossible to foresee, with the least certainty, the result of the action of a variety of elements,—in glass making under the influence of heat, and in photography under the influence of light.

"There is another observation to make as regards the connexion of glass and photography—viz., that without glass there would have been no photography, and that photography is repaying, and will repay still more its gratitude by increasing the consumption of glass. Photographers, for practising their art, are building glass rooms upon the roofs of the best houses in every town, and this will show how easily every house can have its own conservatory.

"The paper we have just heard with so much interest, has a great deficiency, which, in fairness, I am bound to notice. Mr. H. Chance has been just in mentioning many persons who have contributed to the improvements of glass manufacture, but I am sorry he has omitted one who fully deserves to have his merit brought before this meeting. Mr. H. Chance would have deprived us of the knowledge of one of the most important facts connected with the improvements of the manufactory of Messrs. Chance, if I had not taken upon myself to fill the deficiency, which I do with the greatest pleasure, satisfied that the meeting will be happy to know that the improvement I allude to is the work of Mr. James Chance, the brother of the author of this paper. Let us give credit to Mr. H. Chance for his modesty, but let us give credit to the merit of his brother, and I hope my friendly criticism will find an excuse.

"Mr. H. Chance has too briefly noticed that a further development of the sheet glass manufacture in England, was the process of grinding and polishing this glass by machinery, whereby a new branch of manufacture was established, which has furnished glass peculiarly applicable for purposes for which none previously existed.

"This is, indeed, one of the greatest improvements which has ever been introduced in the manufacture of window glass, as it has produced, at a cheap price, an article equal in effect to plate glass, by which all houses can be glazed with a glass which, from the inside, does not distort the objects we look at, and which, from the outside, has the polish and appearance of plate glass.

"To explain all the merits of the invention I must be permitted to expound, in a few words, the process and the difficulties which were to be overcome in the manufacture.

"As Mr. H. Chance has justly remarked, the sheet glass, by the mode of its production, has the polish of its surface spoiled in some degree, but its greatest defect is, that the inside and outside surfaces of the cylinder, not being of the same length, after being developed by the flattening operation, they cannot be in juxta-position on two parallel planes without being forced either one to contract or the other to expand; but as the glass remains too hard during the flattening process to change its molecular arrangement, one surface contracts the other, and the result is a kind of undulating or wavy appearance, called cockles. These cockles reflect and refract light in various and contrary directions, and the objects seen through the glass are thereby distorted.

"Several attempts have been made in France and Germany to grind and polish this glass, in order to destroy these inequalities and imperfections. For this purpose sheet glass had to be made considerably thicker, owing to its never being perfectly flat throughout its length and width, so that one corner or another, and even several points on the surface, were exposed to be completely worn out before the end of the operation.

"Mr. James Chance conceived the ingenious idea of laying every sheet of glass intended to be ground and polished upon a flat surface, covered with a damp piece of soft leather. The sheet adhering completely to the leather after having been pressed against it, producing, in truth, a vacuum, maintaining the whole sheet in a flat position. Two sheets having been placed in this manner, each on the retaining or sucking surface, they are turned one against the other in a horizontal position, sand and water being constantly supplied between them, and by means of the most ingenious machinery, the two surfaces rapidly rub one against the other in all directions, and are ground at the same time by the sand. The whole system of machinery, occupying an immense area in the manufactory, is the invention of Mr. James Chance alone.

"When the grinding has been performed on one surface, the sheets are turned to have the other surface ground in the same manner.

"The sheet being ground while it is kept perfectly flat, it is not necessary to wear out more than a thin layer of the whole surface. Of course, after the operation, the sheet by its own elasticity resumes its former shape more or less curved, but the whole surface of both sides have a polish as perfect as plate glass, and this is the desired condition for glazing purposes. Although the glass could not make perfect mirrors of a large size, on account of the slight curve arising from the flattening operation, still it may be usefully employed for looking glasses of small size. This glass has all the perfection and qualities required for taking pictures by the collodion process, and for framing all photographic and other pictures, for which last purpose it is even preferable to cast plate glass, on account of its lightness.

"Mr. James Chance's invention is therefore, as I said before, one of the most important improvements in the manufacture of window-glass during this century, and to him we owe the cheap kind of glass used in glazing ordinary dwelling-houses, and which is equal in effect to the expensive plate-glass, which was seen before only in the windows of palaces and of aristocratic mansions. We may say that, since the introduction of that glass, London has assumed a more cheerful and luxurious appearance, and that a time will arrive when all houses will be supplied with a kind of glass through which it will be possible to look without fatigue to the eyes, for there is nothing so unpleasant as to see objects distorted in all sorts of ways, as it is with the best crown and sheet glass.

"I have only to add, that if the jury of the Universal Exhibition of Paris had examined and understood the merit of the patent sheet plate of Messrs. Chance's, it would have been sufficient to induce that jury to have awarded them the highest class of reward."

The **Chairman** said they had been favoured with some very valuable information, but altogether from manufacturers. It would, however, be very desirable to have some remarks from consumers of glass, and as he saw his friend Col. Challoner present, who, in his position as an agriculturist, was a very large consumer, he should call upon him for a few observations.

Col. **Challoner** said his observations would merely go to the very great blessing which Sir Robert Peel had conferred upon this country when he took of the duty from glass. When he (Col. Challoner) came from Italy he wanted to know why he could not have the same large panes of glass as at Naples. He applied to Mr. Hetley, a manufacturer in Soho-square, on the subject; that gentleman told him they could not make them. He explained to Mr. Hetley that in Italy they blew the panes of glass into what were called muffs, and opened them by a hot iron, and then put them into furnaces, and they then became perfectly flat. Mr. Hetley said they could not apply that process in this country with advantage, in consequence of the heavy duty. Panes of glass for his conservatory, which at that time—before the reduction of the duty—cost him sixpence a piece, could now be had for a penny. Those connected with horticultural pursuits must feel deeply grateful for the great measure of Sir Robert Peel. He must be allowed to thank those gentlemen who manufactured glass so cheaply, doubtless at a good profit to themselves, as well as to the advantage of the consumer.

Professor **Tennant** said that Fontainebleau sand was not, as was supposed, composed entirely of silica, but contained a large proportion of carbonate of lime, thus acquiring a most singular quality—the property of crystallisation, taking one of the forms of carbonate of lime. In *Shepard's Treatise on Mineralogy*, it is termed "crystallised sandstone of Fontainebleau," and is described as "a variety of calcareous spar mechanically mixed with sand" (*Chaux carbonatée quatzifère* of **Hauy**). With reference to the colour in the glass, it was due to the chemical action produced by the sun's rays, and was to be observed more particularly on the houses having fronts exposed to the south and west. This would be found to be the fact on examining the windows on the north and east sides of the streets of London, and was particularly remarkable in the windows of a house opposite the Star and Garter, at Richmond. This was attributable to an excess of the oxide of manganese, and not to oxide of iron. He concurred in the remark that Sir R. Peel had conferred a great boon upon England by the repeal of the duty on glass. This was one great step in advance. The next was the abolition of the window duty. Previous to the latter change, it was the custom of builders, on all possible occasions, to build houses with as few windows as practicable, in order to avoid the duty—a practice most prejudicial both to health and comfort—for the continuance of which, however, there was no longer any excuse.

Mr. **Varley** could corroborate what Mr. Wilson had stated of glasses having a moisture, by which they sometimes stuck together. He was once shown some very large glasses, by a gentleman who had the largest silvering slab in London. They were beautifully clear, but appeared to be covered with steam, which, when wiped off, appeared again. He had applied to Professor Faraday, in hopes of learning how to cure it. On examining these glasses with a magnifier, the apparent steam was found to consist of very minute but long crystals, which shape indicated nitre, showing that so much potash was used in the manufacture of the glass, that it exuded, and with the air formed nitre. Now repeated washings, (a most serious job with 8 or 10 feet plates), might much lessen the exudable matter. But the glass having become porous all over, a serious injury, as regarded its power of transmitting or reflecting light, resulted. What was still worse was, that such glass could never be wiped so as to remain clean, for the wiping filled up the pores with what should have been quite removed. This began again to exude in minute gummy dots, which continued to enlarge, and on again wiping, smeared the surface, rendering it difficult to clean. Soda was prone to dry and lose its water of crystallisation. Potash, on the contrary, attracted moisture, and became liquid. From this, it would seem that soda would make a more durable glass than potash. As regarded a defective surface, Mr. Varley had had many lenses polished on a composition of bees-wax and polishing-powder. This would not hold anything firm enough to scratch and give it an absolute continuous surface, for it would not spring, and if any part was forced away, it remained there out of action till the remainder was brought to the same level. Therefore such lenses were perfect in surface and in figure to their very edges, and these lenses were easily wiped clean with the same kind of leather that would scarcely wipe another one, as usually polished on a soft springing material, which left a minute waved surface (a serious defect in the lens), into which the leather could hardly dive to wipe it clean. This mode of polishing, when on glass that could exude its alkali, or other matter, and so become porous, the pores would hold food for what was known to opticians as vegetation, which often occurred between lenses when they were put together. As to colour, Mr. Varley had sought for clear and colourless glass to enclose water-colour pictures, and had found some colourless; but on looking through the edge, it was seen to be very much darker than some coloured specimens. This would rob the pictures of so much light as to render them gloomy. Ordinary glass was greenish or bluish. The glass became green by destroying just so much red light, and the red that was put in to neutralise it had destroyed so much blue and yellow light; therefore, when mixed, this red obstructed the free blue and yellow rays, and the green obstructed the free red rays, and the result was just so much black glass mixed with the white; and pictures covered with it, or telescopes made with such, suffered equally from loss of light. The only remedy was, not to doctor the materials, but to seek for pure materials, and keep them so during the process of melting; perfectly mixing the ingredients, if possible, to make them all dissolve into each other, to produce real homogeneity.

Mr. W. BRIDGES ADAMS, through the Secretary, made the following remarks:—

"The subject of the manufacture of glass may very naturally lead to that of the usage of glass for keeping out the weather, and more especially in connection with skylights and green-houses, which are proverbially leaky. This leakyness arises from the want of any provision for expansion and contraction. The putty which connects the glass to the frame is, while new, a plastic substance; when old, a brittle substance. Contraction after heat, therefore, necessarily produces an open joint, either between the putty and the glass, or between the glass and the frame. The putty is analogous to the caulking of ship's decks, composed of plastic pitch and oakum. When the pitch by age ceases to be plastic, the shrinkage of the planks produces open joints in hot weather, the remedy for which is to keep the planks saturated with water. Until, therefore, a caulking is used for glass in skylights sufficiently elastic to keep the joints close under varying temperature, and by reason of its elasticity not subject to damage, a rain-tight skylight cannot be produced unless by the process of making the glass in a single sheet, with the edges bent down all round, to lap over a projecting fillet in the manner of a ship's hatches.

"There is a process which has been used for ages analogous to the object in view. By means of elastic cork, wine or alcohol is kept for an unlimited period unwasted in glass bottles. If, therefore, instead of making cylinders of cork we prepare long parallellograms or strips, and place it between the edges of the glass and the framings, we shall produce a similar result. In this mode skylights may be made impervious to rain. The application is very simple. The glass may either be slid into grooves lined with cork, or placed in open rebates, bedded on cork, or with cork round the edges, or both, or the glass may simply be laid on the frame with a bedding of cork below, and with wood fillets overlaying the glass to keep it in position and in contact with the cork, screwed or nailed down.

"Specimens of cork strips are laid upon the table. Time did not permit, or samples of this kind of glazing would have been shown. Some will be prepared for the approaching Exhibition of the Society. The cost of the cork will be from one halfpenny to one penny per yard run."

The CHAIRMAN said, the white American flint glass exhibited at the Great Exhibition, was a complete illustration of Mr. Wilson's remarks. It had a colourless appearance, and at first sight was somewhat attractive, but on looking at it more closely, it had no brilliancy. No allusion had been made to glass of zinc, which had been the subject of a reward at the Exhibition of 1851. It certainly had a very pleasing and white appearance, and was specially suited to achromatic purposes. It had the remarkable property of being of greater specific gravity than flint glass, and was much more pure and pellucid than glass of lead, which could be only made applicable to achromatic purposes by constant agitation. Thus, by changing the chemical ingredient, heavy glass was produced without agitation, which was necessary with glass of lead or flint glass. A remark had been made about manufacturing kelp, which reminded him of an anecdote. Some time last year he formed one of a number of gentlemen (manufacturers, though in quite a different branch to himself) who attended as a deputation to Lord Palmerston, when the subject of chemistry was alluded to to supersede the use of manure for leather tanning, &c. In reference to the subject under discussion, Lord Palmerston enquired, Why not produce it by chemical means, when an aged manufacturer present asked Lord Palmerston whether he ever knew a chemical manufacturer that did not get into the *Gazette* in six months. There was a good deal of truth in that remark, though he did not wish to deter anybody from attempting to reproduce kelp, guano, or any other production of nature. Time was going on, and he hoped all those difficulties in the way of science would rapidly be removed. There were many other subjects he would have noticed had time permitted, for lovers of his profession must not only look at in a pounds, shillings, and pence point of view, but as poets, philosophers, and chemists. He would congratulate their friend Mr. Wilson on being so successful a manufacturer of those silver plates by which beauty could adorn herself at the toilet, and their friend, Mr. Claudet, for having so perfected the means of fixing that beauty in por- useful traits on the same material. Both were extremely in their way. He concluded by moving the thanks of the meeting to Mr. Chance for his able and valuable paper.

Mr. WILSON moved a vote of thanks to the Chairman, which having been carried unanimously and acknowledged,

The Secretary announced that the paper to be read on the evening of Wednesday next, the 20th instant, was "Recent Improvements in Carpet Manufacture, their Use and Abuse; with a Word on Beauty and Deformity in Carpet Design," by Mr. Alexander Whytock. On this evening Mr. Peter Graham will preside.

The SECRETARY, since the reading of the paper, has received a communication from a gentleman who was present at the discussion, from which the following is extracted:—"I have found that common window glass, if kept fused for two hours in a current of atmospheric air (which is heated to the same point as the melted glass), becomes almost colourless, but I have not yet succeeded in depriving it of the whole of its colour. The fact of the partial removal of colour by oxygen, leads me to differ with Mr. Frederick Pellatt, who expressed it as his belief that the colour was due to the absorption of oxygen. I am inclined to believe that the brown or black colour which was spoken of by Mr. F. Pellatt, as also by Mr. Wilson (as appearing after some time), is due to the formation of binoxide of manganese. I would suggest whether the amethyst colour which is also seen in glass which is colourless, may not be due to the disappearance of the green tint, by the peroxidation of the iron, and consequent removal of that which had neutralised the amethyst. It is much to be regretted that glass manufacturers are not in a position to tell their foremen to try certain experiments and see that they are carried out, for I have lately had permission of a glass manufacturer to use his furnaces, and he himself has ordered his men to try the experiments, but instead, I am told that the glass will not take the stuff, and it is of no use. This is distinctly a rotten system, yet I believe it is universal."—G. F. A.

Colonial Correspondence.

THE NATURAL RESOURCES OF JAMACIA.

Sir,—The pages of the *Journal* being at all times freely devoted to the advancement of the Arts, Manufactures, and Commerce of our Colonies, offer a fit channel for a notice of the proceedings of the Jamacia Society of Arts, which has now passed its first anniversary, with steadily increasing encouragement to the executive body.

Its most prominent effort was the contribution to the Paris Universal Exhibition, which contained a list of no less than 668 articles, including a large variety of samples of the raw and manufactured produce of the island and specimens of its natural history. The success of this endeavour to make known the boundless resources at command, is fully established by the reports of the jurors, and I propose, with your permission, to aid the movement by allusion to a few prominent features of the collection.

The Geological Selection contained many valuable *fossils*, lent for the occasion by the Honourable Edward Chitty, one of the local judges; of whom it must be mentioned that by his researches, aided by those of Professor Adams, the Island of Jamaica, so comparatively small in its area, has been found to open the largest proportional field in the known world for the land and fluviatile conchologist.

The *minerals* consisted of specimens taken from the various local mines opened, and in course of exploration; with many specimens of marble, silicious sand, and white lime-stone, which, though soft when quarried, becomes hard after exposure.

A fine sample of *lithographic stone* was also exihbited, supposed to be of the Lias formation, which is reported to have been lately found in large masses. This discovery seems to be of great importance, and it is hoped that large specimens will soon be forwarded to this country.

The *forest products* included a valuable collection of woods and fibres. The former were prepared for exhibition in a very effective and efficient manner, and experiments were made by competent authorities to test the power of resistance of many varieties. The result will, I have reason to believe, shortly be made public. The entire series has been secured for the museum at the Royal Gardens, Kew. Of the variety of fibres, it is to be regretted that the samples forwarded were so small that experiment was next to impossible. They were prepared by the curator of the local Botanic Gardens, who reports that the island can boast of possessing the finest fibres and the greatest number of textile plants in the world, all of which are capable of being turned to the best account. Certain it is that the list comprised fibre of such quality and colour—from the cocoa-nut coir to filaments resembling fine silk—in strength and lustre of appearance scarcely to be surpassed.

In the collection of *vegetable products*, ample samples of the staple products of sugar and rum were naturally looked for, but in this particular there was a very damaging deficiency. This is much to be regretted, as the produce of various systems of manufacture was exhibited, but in so small a measure as to preclude comparison. The absence of all statistics, which are of the utmost importance in testing the relative merits of various systems, is also to be noticed with regret; but while these defects were freely commented on, the extensive series of *lesser staples* called forth very general satisfaction. Even though the landowners have for many years loudly proclaimed the gradual decline of sugar cultivation, these minor yet highly important products have been wilfully neglected; but this rejection of the gifts of nature must not longer continue. In this department may be mentioned arrowroot, [cocoa, and prepared chocolate; tobacco, cigars, and snuff; cayenne pepper; gums; citric acid; preserves; pickles, &c.; all of tried and appreciated quality.

Among many samples of oil, one attracted more than ordinary attention. It is expressed from the seed of the Moringa (*M. pterygosperma*), which tree thrives in the hot sandy plains, and is grown from cuttings. This oil is very similar to the famous oil of Bheu, and is said to be possessed of the following properties, viz:—1. Never gets rancid. 2. Tasteless, odourless, and nearly colourless. 3. Thin and limpid. 4. Does not corrode, and does not freeze except at a very low temperature. 5. Believed to be superior to Colza oil for burning, and equal to the best olive for culinary purposes.

Another oil, made from the seed of the Sand box, (*Hura crepitans*) seems to offer a valuable addition to the Pharmacopœia—twenty drops being equal (as certified by local physicians) to a table-spoonful of castor oil, and the taste is much less disagreeable.

Some biscuits were exhibited, prepared by the simple process of drying the yam, cocoa, and bread-fruit, which vegetables are much used in the West Indies in lieu of bread—hence called bread-kind. Samples of these biscuits should be duly analysed, as they may become very valuable provision for ships, &c.

Perhaps the most intrinsically valuable contributions were those of edible seeds, fruits, and roots, accompanied by samples of the flour and starch yielded by those plants. Mr. Simmonds has, in a late number of the *Journal*, called attention to the necessity for the production of new farinaceous substances, and specified many of these very products as among the farinas most useful for food and the purposes of our manufactures. If the Jamaica Society will but follow up this effort to introduce these new articles of commerce, it will not only aid the colonial agriculturist, but release much grain now absorbed in the shape of starches.

The value of an apiary in Jamaica was fully tested, and the produce has been much inquired for. The virgin honey was well nigh as clear as crystal; the unbleached wax, from the same comb, was almost white; and the vinegar made from the refuse of the comb, is of extreme delicacy.

It is only doing justice to the executive body of the Jamaica Society of Arts, to state that they brought together and exhibited a very interesting representation of the resources of the island; and the judgment and energy therein necessarily involved, premises much for the success of the larger objects embraced within the proposed plan of operations. It is, indeed, a satisfaction to read the reports of the various Committees, and I am tempted, in conclusion, to make one or two extracts therefrom, as evidence of the spirit which actuates those who so worthily devote their time and abilities to the best interests of the colony.

They have adopted the advice of Viscount Ebrington, addressed to this Society at the opening of the 101st session, and are striving to overcome that "indolent acquiescence in leaving ill alone," which they declare to be so prevalent among the inhabitants.

The Paris Exhibition Committee, modestly enough, admit that it would have been idle for the Society to venture upon a competition with the artistic skill and manufacturing enterprise of European countries, but it was hoped that by the impetus created by the efforts they made, a new era would be opened up for the industrial pursuits of the island, and that many new articles of commerce might be brought into the markets of the world. In allusion to the collection (as exhibited in Jamaica, before transmission to Paris,) it is said to "speak to the spectators in the language of popular instruction;" and the opinion is expressed that there ought no longer to exist an unoccupied class amongst the population, as all can become producers, and thereby gain a decent livelihood, while adding to the general prosperity. It is hoped that the day is not far distant when Jamaica shall possess a museum of natural products, manufactures, a arts, and that annual exhibitions will become organised sources of improvement and enjoyment.

From the "Transactions" of the Jamaica Society of Arts I find that the Council is earnestly at work, endeavouring to secure contributions for a local exhibition, to be held during the early part of this year, and that much progress has already been made in the preliminary preparation necessary for the foundation of a permanent museum, in which latter effort I trust the Society will receive, as far as may be practicable, the hearty assistance of all kindred Societies in this and other countries.

AN OLD COLONIST.

Home Correspondence.

◆

RELATIONS OF THE KILOGRAMME, ZOLL-CENTNER, OR QUINTAL, TO ENGLISH STANDARD WEIGHTS, ACCORDING TO VARIOUS AUTHORITIES.

Weight of Kilog. in Grains.	AUTHORITY OR BASIS.	Corresponding weight of 50 kilogs., being the Zoll-centner or Quintal, in lbs. avoirdupois.
$15{,}432{\cdot}^{348}$	Scientific Commission appointed by the Treasury	$110{\cdot}^{231}$
15,432½	The French Mint	$110\frac{13}{56}$
15,434	The United States Mint	$110\frac{17}{70}$
$15{,}434\frac{1}{12}$	On the basis 10,000 oz. troy = 311 kilogs.	$110\frac{409}{1680}$
15,435	On the basis 63 cwt. avoir. = 64 centners. " 441 lb. do. = 200 kilogs.	110¼
$15{,}446\frac{108}{127}$	The Board of Trade, in re Dutch Weights, *vide The Gazette*, 29th January, 1856	$110\frac{85}{254}$
15,470	The Board of Trade, 1855:—"Statistical Tables relating to Foreign Countries."	110½

SIR,—At this conjuncture, the tabulated form given above may usefully illustrate the disparities to be overcome in order to maintain precise correspondence between weights ostensibly identical. Some of the discrepancy is, no doubt, attributable to the practice of making the kilogramme of commerce a little heavier than the platinum standard in Government charge, by way of compensating for the "draft of the scale," which is commonly given with weighed commodities. Some further discrepancy may be due to the well-known tendency of ordinary metal weights to become heavier by oxidation.

In converting French, German, Dutch, and like weights into English equivalents, I find it convenient to assume—

311 kilogs. = 10,000 oz. troy; or
200 do. = 441 lbs. avoirdupois.

Those English quantities are slightly in excess of the two authoritative valuations at the head of the table, but may be reduced to them approximately by deducting one-sixth per mille, or, still closer, 17 per 100,000.

The numbers on the line commencing 15,435 are all composed of convenient factors, *e.g.* $15{,}435 = 7^3 \times 5 \times 3^2$.

Disregarding fractions of a grain in the first two lines, it is easy to recollect that 123,456 grains equal 8 kilogs. of 15,232 grains each.

An ingot of English standard-gold weighing 123,456 grains = 257⅕ ounces troy, is, within say ⅛ per mille, exchangeable at Bank rate (77s. 9d. per oz.) for £1,000 precisely; and 22 such kilogs. of fine gold are exchangeable for £3,000, precisely.

If the ingots prove heavier by, say ⅛ per mille—*i.e.* $15{,}434\frac{1}{12}$ grains per kilog.—the exchangeable values will be the round sums £1,000 and £3,000 respectively, without deductions.

Yours, &c.,
J. A. FRANKLIN.

London Institution, 1st February, 1856.

P.S.—I hear that it has been proposed to the Monetary Congress still sitting at Vienna, to adopt as a gold basis a coin equivalent to our sovereign, as referred to in my letter in the *Journal of the Society of Arts* of the 21st December last.

ON ENGLISH DECIMAL COINS.

SIR,—Several countries, as China, Russia, and Portugal, which have a very small unit of account, of necessity have had a decimal system of account from the earliest period. Some other isolated states, as Rome, divided their coin in a decimal manner before the end of the last century; sometimes, as in Rome, the decimal and the mixed system being in use at the same time. Jefferson, in America, shortly after the separation from England, proposed to take the Spanish dollar as the unit, and divided it into 100 parts, a coinage exactly like that existing in Rome. France, shortly after, followed the American lead, and divided its *franc* or *livre* into 100 *centimes.*

But it appears that an English Company, the Sierra Leone Company, probably influenced by the discussion in America, at any rate were the first to issue a series of decimal coins. They put forth, in 1791, four beautifully executed silver and two copper coins, all bearing a lion on one side and a pair of hands united in friendship on the other. The pieces are called a "one dollar," "half dollar," "twenty cents," and "ten cents piece," and marked in numbers, 100, 50, 20, 10. The copper coin is called a "one-cent. piece" the size of our half-penny, and the other "one-penny piece," thus retaining the name of that universal coin. These coins are in my cabinet. The earliest American decimal coins I have seen, are dated 1794, and the earliest French are dated ann. 5 = 1797.

The Sierra Leone dollar is said to be divided into 10 matucas by the negros, who use the latter as their unit of account.

Yours, &c.,
J. E. GRAY.

Feb. 10, 1856.

TONNAGE REGISTRATION.

Woolwich Dockyard, Feb. 9, 1856.

SIR,—I beg to acknowledge having received by the *Journal of the Society of Arts*, of the 8th inst. the letter which Mr. W. S. Lindsay has been pleased to address to me on the subject of my paper on Tonnage Registration, read before the Society of Arts on the 16th ult. I do not think that any gentleman not personally interested in this question, and familiar with the freedom of speech permitted in discussions of this character, will, on deliberately reading my paper, attach to my arguments the construction which Mr. Lindsay has assumed. I have based my arguments on general principles, and I disclaim all personalities,—first of all, because I do not feel them; and next, because, if I were so actuated, the bandying of such irrelevant matter would distract attention from the real points of this discussion. I do not challenge the *substance* of the Merchant Shipping Act of 1854, but I assert its *deficiencies* in so far that under this Act the published tonnage registration of shipping does not inform the public of the tons weight of cargo that ships will safely carry, or the tonnage measurement of cargo that a ship will hold; also, by this Bill, the deep loading of ships, on which safety at sea so much depends, is not subjected to any legally recognised control; nor are the data essential to the scientific analysis of the properties of ships at all embraced by our present system of tonnage registration, as prescribed by the law of 1854.

The general question as to the effect of insurance brought under consideration by my paper, is not met by special allusion to individual practice, as referred to by Mr. Lindsay; the question is, whether the fact of a ship and its cargo being well insured against loss at sea, tends to check imprudence in the loading of ships, to which no limitation is assigned by law.

Further, as no useful conclusions can result from discussion unless the objects under discussion be clearly defined, I would question what Mr. Lindsay means by the observation that the tonnage registration under the Merchant Shipping Law of 1854, "has given every satisfaction to the interests who are the best judges of its merits, or for whose benefits it has been established." The construction which I put on the Merchant Shipping Law of 1854 is, that the interests and benefits intended to be served by the operation of that law are not those of any particular class, but of the public at large, whose interests and benefits are greatly dependent—first, on the effectiveness of statistical registration for promoting the purposes of maritime discipline, as dependent on the capability of a ship for weight cargo being known (a matter somewhat touching the *income-tax*, perhaps);—secondly, for affording data for pointing out the conditions under which the transport of grain and other merchandise can be effected at the least cost of freight (a matter somewhat touching the *price of bread*);—and, thirdly, for subjecting the deep draught of vessels on leaving port to official supervision (a matter somewhat touching the *liability to wreck*);—none of which points are embraced in the law of 1854. If we do not agree as to whether the intended object of the law referred to was protective CLASS LEGISLATION or legislation for the PUBLIC GOOD, we need no longer to discuss the subject; and even if we do agree on this point, if Mr. Lindsay disclaims being able to perceive the use of these details of statistical registration wherein the present law is deficient, as means for the attainment of the objects above referred to, why, really, all I can do further for Mr. Lindsay in this matter is to refer him, as I have done others in the like emergency, to study a certain essay, entitled "Atherton's Steam-Ship Capability," 2nd edition, published by Weale, especially the supplement thereof, exemplifying, what is called in the preface to the work, "the Arithmetic of Steam Ship adaptation to the requirements of Mercantile Service,"—a study peculiarly called for in the present aspect of shipping affairs.

I am, Sir, your very obedient servant,
CHAS. ATHERTON.

TONNAGE REGISTRATION.—LIABILITY OF BRITISH SHIPOWNERS.

SIR,—The communication of Mr. Atherton, which appears in No. 166 of the *Journal of the Society of Arts*, requires a few words from me in reply, in order that "the public may have the truth" as to the liability of British shipowners in the event of loss of life at sea. Mr. Atherton quotes the substance of three or four clauses of the Merchant Shipping Act 1854, to show, as he says, the extent of the penalties to which shipowners are liable under the Act; but, as if determined to carry out his principle of *displacement* in all matters, and even in support of an error, which I have no doubt he has inadvertently fallen into, he puts forward a few minor penalties in place of the "stringent provisions in regard to the sea-worthiness of ships," to which I still affirm the British shipowner is subjected, under the Merchant Shipping Act 1854, and which, as I stated in the discussion that followed the reading of Mr. Atherton's excellent paper, will be found to inflict heavy penalties in the event of loss of life at sea through the unseaworthiness of ships, from whatever cause it might arise. Part IX. of the Act is entirely devoted to the liabilities of shipowners, and, from its having a special heading to denote this fact, it cannot be easily overlooked. It declares, among other things, that:—

"Where any loss of life or personal injury is caused to any person being carried in a ship, the owner shall not be answerable in damages to an extent beyond the value of his ship and the freight due, or to grow due, *the value; in no case, to be taken at less than £15 per registered ton.*"

"The damages payable in each case of death or injury shall be assessed at *thirty pounds.*"

These, be it remembered, are liabilities to which the shipowner is subject when the accident or loss occurs "*without his actual fault or privity,*" and in order to show the operation of this part of the Act, it is enough, perhaps, to refer to one case which occurred within a week after the statute became law. It is, in fact, one of the 1799 cases of shipwreck recorded in the *Shipping and Mercantile Gazette* during the year 1855, in regard to which Mr. Atherton invites me to "take the pains to show the penalties" attending the loss of life. In May last the emigrant ship *John*, bound to Canada, with about 300 lives on board, was lost off Falmouth, through the incompetency of her commander, by which incompetency, of course, the ship was rendered unseaworthy. The greater number of the passengers unfortunately perished; the penalties of the Act were consequently put in force, through the Marine Department of the Board of Trade; and as Mr. Atherton has referred me to the columns of the *Shipping and Mercantile Gazette*, I cannot do better than quote the remarks of the editor of that journal on this very case, to show the extent of the supervision of Government in regard to the seaworthiness of ships, as well as the nature of the penalties to which shipowners are liable in the event of loss of life. The clause of the Act to which I have referred, it will be remembered, declares that, in estimating the damages, the value of the ship shall not be taken at less than £15 per ton. The *John* was 465 tons register, and the editor, it will be perceived, complains of the injustice, on the part of the legislature, of fixing this arbitrary estimate,* which, he says, must in many cases involve an amount of more than three times the value of the property on which the liability is incurred. But I will let the editor speak for himself:—

"Would any of our readers, acquainted with the value of shipping, have been disposed to purchase the *John*, before she left Plymouth, at one-third of £15 per ton, or, as the figure would stand according to the Act, of £6,975. Here is a ruinous liability of, say £7,000., thrown on property that would, in all probability, be highly estimated at £2,000. But this is not all. In the present case, involving as it does a calamitous loss of life, the responsibility may not stop at the *minimum* estimate of the Act. We find in clause 510, which directs the distribution of the penalty, that one of the rules to be observed as to damage thus recovered, and the application thereof, is as follows:—

"The damages payable in each case of death or injury shall be assessed at *thirty pounds.*"

"Now, presuming that all who were on board the *John*, being 263 souls, have sustained more or less injury (most of them, unfortunately, are dead), the amount, at £30 per head to be so distributed, would be £7,890; which sum, it should be observed, the Act declares shall be *first* applied; that is, before any other claims as to loss of property, &c., shall be satisfied. So that, under this *minimum* estimate, there is positively no limit to the liability which might be inflicted on a shipowner by the Act, and which, under the mildest form, we have shown to be ruinous."

These are some of "the heavy penalties" to which I referred Mr. Atherton in the few remarks which fell from me in the discussion which followed the reading of his paper; and I feel that I cannot better instance the nature of "the supervision of government," and "the stringent provisions in regard to the seaworthiness of ships,"—with which, I ventured to submit, the public ought to be acquainted—than by quoting another paragraph from the same article. The writer says:—

"But the question will naturally occur—Why punish the shipowner at all for an act—it may be 'of God'—or, at all events, declared by the law itself to occur 'without his actual fault or privity?' It should be remembered that by Act of Parliament the shipowner is, in a manner, relieved of the chief responsibility in respect of his ship and her appointments, as well as in regard to the ability and efficiency of her officers and crew. The law provides that the Government officer, appointed for the express purpose, *shall see and satisfy himself that the ship is in all respects in a fit and proper condition to undertake the intended voyage*, and that the appointments are strictly in accordance with the provisions of the Act, which set forth the requirements to the minutest details. He is further commanded not to permit the ship to proceed to sea until he is satisfied that she has on board, at the time of clearance, a full and efficient crew, which, as it regards number, is also carefully described in the Act, in proportion to the tonnage of the ship. The owner, moreover, is forbidden, by the law, to place in command of his ship—be he master or mate—any but what are declared, by the examiners appointed under the Act, to be *competent* in all respects to navigate her, and fit to be entrusted with the lives and property on board—for which, notwithstanding, the owner is made liable in the event of accident. You first tell the shipowner, by your special surveys and inspections, that he has a good and sufficient ship for the given voyage, according to Act of Parliament; that she is in all respects well-found, appointed, and manned, according to Act of Parliament; and that she is commanded and officered by competent or experienced men—to whom certificates are given as vouchers of the fact, for the satisfaction of the owner, as well as the public—also according to Act of Parliament. It will thus be seen that the Government takes upon itself the responsibility as to the fitness and efficiency of the owners' property and servants—from the hull to every incidental appointment in the ship, and from the captain to every individual sailor;—and yet, at the same time, in the event of loss, whether from accident or incompetency, it shifts the whole *penalty* on the shoulders of the shipowner, who has merely been a passive instrument in the hands of the law, and who has, of necessity, complied with all its requirements."

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* Vide *Shipping and Mercantile Gazette*, May 18, 1855.

I think it will thus be seen that, however much shipowners might be disposed to be regardless of the safety of life at sea, the legislature has not left them "to do as they please with their own," to the public detriment, as Mr. Atherton, in contrasting our maritime with our railroad system, would lead us to infer. I need not, therefore, occupy your valuable space in discussing with Mr. Atherton the question of the comparative honesty or "commercial cleverness" of British shipowners, as exemplified in their alleged approval of the present mode of Tonnage Admeasurement in preference to his. I may, however, state my conviction, that not one in ten of our shipowners knew anything whatever of the nature or tendency of the new tonnage law until it was in full force, and that very few more, if any, are even now much better acquainted with the subject.

I am, Sir, your obedient servant,
WILLIAM MITCHELL.

54, Gracechurch-street, City.

EXAMINATION OF CLASSES IN INSTITUTES, AS APPLICABLE TO THE COLONIES.

Sir,—As a member of the Jamaica Society of Arts, and during my residence in England one of its general agents, I submit a few remarks relating to the system of awarding certificates or diplomas to students of classes in such Institutes as are in Union. I do so with the less hesitation having pressed the subject of Union with Colonial Institutions upon the Council, urging the expediency of such extension.

The following extract from the minutes of the proceedings of the Jamaica Society of Arts, will afford some evidence that the subject has for some time occupied my attention:—

At a Meeting held at the Court House, Kingston, on Wednesday, 9th May, 1855, His Excellency the President in the Chair,

Mr. Valpy gave notice of the following resolution, which he would submit for consideration at a future meeting:—

"That a committee be appointed to consider the plan proposed by the Council of the Society of Arts for the examination of, and granting certificates to, students of classes for adult instruction in Societies in Union, and to report whether this Society, if received into Union, can, with any prospect of benefit to the inhabitants of the island, co-operate in such plan."

From the moment that I had perused the memorandum published in your *Journal*, vol. ii., No. 102, p. 821, I was impressed with the belief that a modified plan might be made to exercise an important influence on educational training in the Colonies. If it be true that in England sufficient inducements have not been generally given to the members of the various Institutes to pursue systematic studies, which defect it is intended to remedy by stated examinations, accompanied with the reward of a certificate or diploma, whereby it is hoped to supply some of the advantages which are so abundantly offered to the higher classes of the community in their competitive examinations, honours, and degrees; if, I say, such a system is required in England, surely the want must be felt with largely-increased force in the Colonies, where even the competition for collegiate honours and degrees, so widely extended in this country, has become far beyond the reach of the depressed colonists.

In Jamaica we have some good preparatory schools, but beyond this point there is no stimulus to excite emulation. As soon as the bounds of school discipline are removed, the mind wanders in the wilderness of light literature and unprofitable amusement, finding no support on which to climb to eminence in any branch of study.

It is naturally felt that the inhabitants of each country or district should enjoy the emoluments, as well as the other advantages of those Institutions which are supported by local taxation; and it is a matter of deep importance that the candidates for office should be specially trained and completely educated. Here is the point at which the existing school system fails. Some of those gentlemen who are engaged in the work of education are fully competent to carry on the studies of their pupils to full proficiency, and the mental endowments of the scholars are by no means deficient. The absence of all competitive stimulus for degrees or honours, is the great want in our present prostrate condition.

It seems to me that this requirement may, in a great measure, be supplied, if the system of examinations for certificates or diplomas from the Society of Arts can, practically, be extended, in which case much benefit would be derived by the colonists, and the influence of the Society would be greatly increased. A candidate for patronage and employment, having such a certificate in his possession, would be placed in an advanced rank amongst the competitors, and his claims would not be lightly passed over.

The ability of each separate colony to adopt such a system as is proposed, must depend on local circumstances, so widely dissimilar, that I believe it will be impossible to develope and determine upon any fixed plan, and I would venture to suggest that the Council of the Society of Arts should authorise each Colonial Institute as accepted in Union, to report the plan by which it shall consider the system can best be brought into operation in that particular colony, together with such rules for local guidance as it may deem requisite, at the same time appointing an agent in England to mature the plan and settle the rules with the Council. From my knowledge of colonial life, I believe it will be necessary in all Colonial Institutes to dispense entirely with classes, as it would be impossible to secure attendance for study in such form. The 5th condition, as published in the number of the *Journal* already noticed, on which Associations (or Local Unions) are taken into Union, seems to provide a remedy for a similar anticipated difficulty in some parts of England. I would also propose that the examinations should be open to students of all ages, whose names should be previously entered on the books of the local Society as candidates; but I must not be tempted to enter into detail at this period.

There are men in the colonies fully capable of undertaking the responsible position of examiners, and the fact of a local examination (if scrupulously and independently arranged and conducted) would give increased local influence to the certificate, and there would, doubtless, be a friendly interchange of confidence between the several colonies.

Considerable time must necessarily elapse before any Colonial Association can, under any circumstances, be found in a position to present candidates for examination, and I am desirous that these, my views, if they appear to the Council to be worthy of consideration, shall, by publication in the *Journal*, be submitted to all such Associations, in the hope that their attention may be called to the subject, and their opinions elicited.

LEONARD ROWE VALPY.

Addison-road, Kensington,
23rd January, 1856.

Proceedings of Institutions.

Halstead.—On Tuesday evening, the 29th ult., the annual *soirée* of the Mechanics' Institution took place. The attendance on this occasion, and the character of the entertainment, were superior to that of any previous year. This is the more gratifying and encouraging from the fact that the whole machinery put in motion for the evening's entertainment was confined entirely, so far as extempore addresses, and the performance of music, and the singing of glees, &c., went, to members of the Institute. After tea, *Non nobis Domine* was sung; and, while preparation was being made for the crowded audience to listen to the addresses, the company adjourned to the "Board-room," where was exhibited a large number of valuable photographic sketches and prints lent by the Society of Arts and E. Hornor, Esq. There was also an extensive collection of minerals, the property of the Institution, and a cabinet of coins sent by the Rev. Charles Burney; Messrs. Flavell and Brown contributed other coins and cases of birds. There was likewise a small printing press at work, throwing off, in considerable numbers for immediate demand, a humourous poetic effusion by a member of the Society of Friends, having especial reference to the celebrities of the locality, both past and present, the profits of sale being appropriated to the benefit of the Institute. Having returned to the hall, G. W. Harris, Esq., V.P., took the chair, and, in a congratulatory address to the audience, introduced Edward Hornor, Esq., the president of the Institute, who, for three-quarters of an hour, gave a very interesting account of his late trip to the Pyrenées, interspersing it with graphic sketches, both of scenery and different shades of character with which he came in contact. He narrated some interesting anecdotes of his travels by sea and land, and these were given with much effect, and were highly applauded. Mr. Davison was then called upon by the chairman. He gave an interesting description of New Zealand, where he formerly resided. After some more singing, the Rev. W. Clements read an elaborate paper "On Fine Art among the Jews." In tracing the artistic skill of any ancient nation, he observed, it is obviously important that we possess monumental remains; verbal description fails to convey that accurate conception essential to a correct acquaintance with works of art. Happily, we were favoured with such aids in tracing the artistic skill of many ancient nations. Assyria, Egypt, Greece—all furnish abundant monuments. It is otherwise with the Hebrew nation, since we are thrown almost exclusively on its writings. The interest, however, gathered around this nation will ever secure for it veneration, and although there are many points of far higher interest, yet, even in that of its artistic skill, there is sufficient attraction to awaken inquiry and sustain a spirit of investigation. Thrown, as we are, upon the literature of the Hebrews, our only means of acquainting ourselves with the principles and details of their works of art is the study of these. In so doing we should discover they were far advanced in artistic skill and wisdom. Mr. Clements here entered into a review of their power, by a description of the varied departments of art in which they excelled. They were skilled in the art of metallurgy, gem sculpture, sculpture in wood; also in the lighter departments of embroidery, weaving in colours, dyeing, working in leather, spinning, the manufacture of fine linen, and the preparation of oils, perfumes, and unguents. Details of these were indicated by descriptions of the Tabernacle and its furniture, the robes of the Jewish priests embellished with polished gems, &c., &c. If the learned researches of men who had studied the characters and symbols on the rocks of Sinai really resulted in demonstrating a Hebrew origin for those characters and symbols, and an origin of the date of Israel's sojourn in the Wilderness, then had we in these rocks monuments of Hebrew art, as deeply interesting as those of Assyria, brought to light by Layard. But, with this exception, all monuments of Hebrew art had long since perished, and vain was the hope that another Layard would arise to uncover the sepulchres in which they were buried.

> "All is silent now, and Zion's holy place,
> Trodden under foot and mingled dust with dust."

It becomes an interesting inquiry, Whence the Hebrews derived their skill, and borrowed their types?—Israel's abode in Egypt had been singularly confirmed by recent monumental remains. Their testimony is, "That Israel dwelt in Egypt, and laboured on the public works at the very time when some of the grandest and most beautiful edifices were constructed in the valley of the Nile." Whilst this fact bore witness to the truthfulness of the Mosaic writings, how clear is it, that the Jews owe their artistic skill to Egypt, and that thence they borrowed their patterns, for it is inconceivable that a people so long cradled in a nation in the highest state of civilisation and art, could come out thence without largely partaking of the manners of that nation, and be imbued with a spirit of its artistic skill and wisdom. In the absence of monuments peculiarly Jewish, it is obvious we may study the principles and details in such as are Egyptian, and of these we had some fine specimens in the Egyptian department at the British Museum, and a charm was thrown around these relics when we considered we saw in them types of those precious works of art wrought by the hands of the favoured people of God. An objection might be raised, Would Moses copy works of art prostituted to the worship of idols, in constructing a service for Jehovah? In meeting this objection, Mr. Clements referred to a recent writer who had studied the source of Egyptian art, and whose conclusions were, that the art of Egypt was not *original* nor of *an Eastern Asiatic origin*, but from *Chaldea*, the seat of primeval man. The conclusion, therefore, was that though the Hebrew artists copied Egyptian types, those Egyptian types were derived from times and persons who employed them in primitive worship. They were not originated by idolaters, although prostituted by them in their worship. The Hebrews, as a nation, did not progress in art. "From the splendour of its beginning, we might have expected a glorious career," says an eloquent writer. Why should not the heroic forms of Judah's warriors, if sculptured by Jewish chisel, and the beauty of the daughters of Jerusalem, if delineated by native pencil, have just as far excelled the marbles of Phidias, or the paintings of Apelles, the statues of Michael Angelo, or the Madonna of Raphael, as the majesty of the Psalms and the sublimities of the Prophets surpass the lyrics of Pindar or the descriptions of Homer?" It is asked why? That they did not, is certain; and a disappointment is felt by the lovers of art and admirers of beauty. In a few centuries the genius of the nation died out. Solomon, in the erection of his Temple, was compelled to call in the aid of foreign artists; and subsequently, the genius of the nation rose no higher in art than what was necessary in the commonest handicraft trades. Two reasons may be assigned for this. In the Hebrew nation there was not that scope for artistic genius as in other nations. They were limited to certain selected patterns, beyond which the Hebrew artist was forbidden to go. This must have been highly detrimental to the progress of Jewish art. It was otherwise in Egypt, Greece, and Rome. New gods continually sprung up, and these called for new embodiments. New idols were conceived, and sought to be expressed in sculptured marble, or other forms of sculptured art: there was, therefore, a continued demand made on artistic genius, and abundant scope for its culture. Another serious drawback to the artistic genius of the Hebrew nation was its exclusiveness. Hebrew artists were not in a position to profit by the advancing skill of other nations, nor had they scope for any productions arising up in their own. The Hebrew nation, poor as it is in monuments of art, and deeply to be regretted as this circumstance is, we may congratulate ourselves that it is rich in Hebrew literature. No other nation has bequeathed to us writings so characterised by grandeur of thought and beauty of diction; so ancient in their date or so important in their subject. All other historians, poets, writers of every class sink into comparative insignificance in the presence of Moses and the Prophets, David, and the other Hebrew bards; and what gives them their highest value of all is, that they are able to make us wise unto salvation.—The performance of the Glee, "The Red Cross Knight," by Messrs. Portray, Sach, and Maskell, was loudly encored. Mr. Wiedmayer presided at the piano. The Rev. C. Burney then rose, and in a very appropriate speech, adverted to the benefits arising from such Institutions, and moved a vote of thanks to the gentlemen who had addressed them, and also to those who had enlivened the meeting by their excellent singing.

MEETINGS FOR THE ENSUING WEEK.

Mon. London Inst., 7, Dr. John Tyndall, "On the Nature and Phenomena of Heat."
Chemical, 8.
Statistical, 8, Mr. Robert Hunt, "On the Present State of the Mining Industries of the United Kingdom."
Tues. Royal Inst., 3, Prof. Huxley, "On Physiology and Comparative Anatomy."
Civil Engineers, 8, Mr. G. P. Bidder, "On Mental Calculation."
Linnean, 8.
Pathological, 8.
Wed. Society of Arts, 8, Mr. Alexander Whytock, "Recent Improvements in Carpet Manufacture, their Use and Abuse; with a Word on Beauty and Deformity in Carpet Design."
Geological, 8, Mr. H. Poole, "Report of a Visit to the Dead Sea;" 2, Prof. Owen, "On the Affinities of the Large Extinct Bird (*Gastornis Parisiensis*) indicated by a Fossil Femur and Tibia discovered in the lowest tertiary, near Paris;" 3, Prof. Owen, "On some Mammalian Fossils from the Red Crag of Suffolk."
Thurs. Royal Institution, 3, Professor Tyndall, "On Light."
Antiquaries, 8.
Royal, 8½.
Fri. Philological, 8.
Royal Institution, 8½, Prof. Faraday, "On Magnetic Actions and Affections."
Sat. London Inst., 3, Mr. E. W. Brayley, "On Geology."
Royal Institution, 3, Professor Odling, "On Organic Chemistry."
Royal Botanic, 3¾.
Medical, 8.

PARLIAMENTARY REPORTS.

SESSIONAL PRINTED PAPERS.

Delivered on 6th February, 1856.

Par. No.
8. Railway Acts—Return.
8. Bills—Burial Grounds (Ireland).
11. Bills—Juvenile Offenders (Ireland).
18. Bills—Police (Counties and Boroughs).
20. Bills—House of Commons' Offices.
Agricultural Statistics (Scotland)—Supplementary Report.

Delivered on 8th February, 1856.

13. Navy—Statement of Excess of Expenditure, 1854-55.
14. Transport Service and Prisoners of War—Estimate.
15. Post-Office Department (Packet Service)—Estimate.
16. Navy Estimates.
3. Bills—Formation, &c., of Parishes.
5. Bills—Episcopal and Capitular Estates.
9. Bills—Court of Chancery (Ireland) (Jurisdiction).
14. Bills—Court of Chancery (Ireland) (Appeals).

Delivered on 9th and 11th February, 1856.

6. Queen Anne's Bounty—Account.
7. Acts of Parliament—Return.
11. Bank of England—Annual Accounts, &c.
18. Civil Services (1855-56)—Supplemental Estimate.
12. Bills—Court of Chancery (Ireland) (Procedure).
13. Bills—Court of Chancery (Ireland) (Receivers).
15. Bills—Court of Chancery (Ireland) (Sales of Estates).
21. Bills—Church Rates.
22. Bills—Charitable Uses.
Turnpike Trusts (England and Wales)—General Report of the Secretary of State.

PATENT LAW AMENDMENT ACT, 1852.

APPLICATIONS FOR PATENTS AND PROTECTION ALLOWED.

[*From Gazette February 8th*, 1856.]

Dated 15th November, 1855.

2577. George Lister, Leamington—A cooling apparatus to be used in brewing.

Dated 7th December, 1855.

2765. William Inlam Ellis, Salford—Improvements in the slide valve or valves of steam or other motive-power engines.

Dated 12th December, 1855.

2805. Robert W. Davis and Daniel Davis, Yellow Springs, Greene, Ohio—Improved vice.

Dated 15th December, 1855.

2836. George Coats, Glasgow—Improvements in horse shoes and in attaching the same to horses' feet.

Dated 28th December, 1855.

2935. Francis Preston, Manchester—Improvements in the construction of military small-arms.

Dated 3rd January, 1856.

19. James Bagster Lyall, Castle Frome, Hereford—Improvements in carriages.

Dated 9th January, 1856.

67. Frederick Albert Gatty, Accrington—Improvements in the manufacture of lake colours.
71. John Ashworth, junior, Turton, Lancaster—Improvements in lap machines or apparatus used in the preparation of cotton and other fibrous substances for spinning.

Dated 10th January, 1856.

79. John Erskine, Glasgow—The application of a new material or mixture for dressing or sizeing textile fabrics or materials.

Dated 18th January, 1856.

133. Giuseppe Antonio Tremeschini, Vicence (Lombardo Venetian)—Improvements in electro-telegraphic communications.
135. Miguel de Bergue, Barcelona—Improvements in the permanent way of railways.
137. William Marshall, Smethwick—Improvements in rolling iron for the manufacture of gun barrels and tubes, and for other like purposes.
139. David Shaw, Gee Cross, Chester—Improvements in looms for weaving.
141. Nathaniel Shattswell Dodge, St. Paul's Churchyard—Improvements in treating vulcanized india-rubber or gutta-percha. (A communication.)
143. Jonathan Holden, Halifax—Improvements in machinery for cutting or carving and figuring wood.
145. Joseph Marzolo, Padua—"A reproductive organ," printing with known notes any musical fancies, and equally applicable to piano-fortes, melodiums, harmoniums, accordeons, and generally to all keyed musical instruments.

Dated 19th January, 1856.

147. Alfred Heaven and William Booth, Manchester—Improvements in machinery for embroidering fabrics.
149. Edward Pickering, Chatham-place, Blackfriars—Improvements in the permanent way of railways.
151. Isaac Barnes, Birmingham—Improvements in carriage lamps.
153. Frederick Ayckbourn, 10, Princes-street, Stamford-street—Improvements in the cleaning of knives and forks.
155. Charles Robertson, 68, Mark-lane—Improvements in mariner's compasses.

Dated 21st January, 1856.

159. James Pockson, Penton-street, Walworth—Improvements in the construction of roofing and other tiles.

Dated 22nd January, 1856.

163. Jean Baptiste Pierre Alfred Thierry, Junior, Jean Louis Richard, Paris, and Baron Henry de Martiny, Versailles—Improvements in preventing smoke by means of a fumivore hygienic apparatus.
165. John Gedge, 4, Wellington-street South, Strand—Improvements in bending, edging, and soldering tin. (A communication.)
167. Alexander Robertson, Upper Holloway—A new manufacture of cases or canisters for dry goods, edibles, and such like commodities.
169. Edward Lawson, Leeds, and George Jennings, Hunslet—Improvements in reeling machines for winding flax, cotton, and other yarns.
171. Joseph Francis, New York—Improvements in the manufacture of metallic boats.

173. Henry Elliott Hoole, Green Lane Works, Sheffield—Improvements in stove grates.

Dated 23rd January, 1856.

175. George Holcroft, Manchester, and James Peacock, Salford—Improvements in casings for fencing horizontal shafts.

177. Alexandre Tolhausen, 7, Duke street, Adelphi—Improved lock joint for the rails of railways. (A communication.)

179. Edward Lloyd, Dee Valley, near Corwen, Merionethshire—Improvements in valves, and in the valve-gear of locomotive and other steam-engines.

183. Isaac Barnes, Birmingham—Improvements in the manufacture of knobs and furniture for doors, drawers, and other similar purposes, parts of which improvements are also applicable to the manufacture of cornice poles and other like articles.

185. Stephen Norris, New Peter-street, Westminster—Improvements in the manufacture of boots and shoes and other coverings for the human feet.

Dated 24th January, 1856.

186. Louis Antoine Romain Richoux, Paris—Improvements in clock works.

187. Pierre Samain, Meusnes (Loire-et-Cher), France—Improved levelling instrument.

188. John Solomons and Edwin Lander, Birmingham—Improved cigar holder.

189. Charles Rothwell, Stalybridge—Improvements in self-acting mules.

190. John Strafford, Stratford—Improvements in portable signal lamps for railway, marine, and other purposes.

191. John and George Gimson, Staley Bridge—Improved apparatus applicable to steam pipes used for the purposes of heating and drying, which said apparatus may also be used for other similar purposes where steam is employed.

192. John Henry Johnson, 47, Lincoln's-inn-fields—Improvements in air beds, mattrasses, and cushions. (A communication.)

193. George Brooks Pettit and Henry Fly Smith, Oxford-street—Improvements in gas heating apparatus.

194. David Fisher, 12, Ranelagh-road, Thames-bank—Improvements in machinery for pressing, cutting, drying, and opening tobacco.

Dated 25th January, 1856.

196. Alexandre Tolhausen, 7, Duke-street, Adelphi—Improved machine for boring and other cutting operations in stone and other mineral substances of similar character. (A communication.)

198. Andrew Shanks, 6, Robert-street, Adelphi, and Francis Herbert Wenham, Effra Vale Lodge, Brixton—Improvements in water guages.

200. John Kershaw, Stockport—Improvements in apparatus for preventing the explosion of steam boilers.

202. Joseph Peak, Manchester—Improvements in machinery or apparatus for pointing and turning bolt-heads, facing nuts, centreing, drilling, and similar purposes.

204. Alexander Dalgety, 76, Florence-road, Deptford—Improvements in vices, or gripping or holding apparatus.

206. William Owen, Red Lion-square—Improvement in pianofortes.

Dated 26th January, 1856.

208. George Henry Ingall, Old Broad-street, and George Oscar Shaw Browne, Glasshouse-street, Nottingham—Improved method of railway signalling.

210. George Napier, Bath-street, Glasgow—Improvements in the construction and arrangement of the flues, air passages, and other parts of furnaces, and also in controlling the passage of smoke, and in heating and regulating the supply of air to facilitate combustion.

212. Edward Vincent Gardner, 24, Norfolk-street, Middlesex Hospital—Improvements in heating, drying, desiccating, and evaporating.

214. Jean Louis Ambroise Huillard, Paris—Improvements in the processes of singeing and dressing textile fabrics, and in apparatus for the same.

216. Samuel Statham, Islington—Improvements in electric telegraph conductors.

218. William Beasley, Smethwick—Improvements in machinery or apparatus to be employed in rifling the barrels of fire-arms and ordnance.

Dated 28th January, 1856.

222. John Wormald, Manchester—Improvements in machinery or apparatus for folding, "fenting," and making up goods or fabrics.

224. Augustin Magloire Jullienne, Herblay (Seine-et-Oise), France—Improvements in brakes for railway trains.

226. Pierre Samain, Meusnes (Loire-et-Cher), France—Improvements in tables, stools, and other pieces of household furniture.

228. Robert Barrow, 32, Garford-street, Poplar—An equilibrium slide valve for steam engines.

230. William Asbury, Birmingham—Improved tap or stop cock.

232. John Whitehead, Leeds—Improved machinery for fulling cloth. (A communication.)

Dated 29th January, 1856.

234. George Darlington, Minera, near Wrexham—Producing oxide of zinc from its ores.

236. Daniel Foxwell, Manchester—Improvements in sewing machines.

238. Robert Thatcher, Oldham—Improvements in preparing for doubling or spinning cotton or other fibrous substances.

240. Owen Murrell, Bethnal Green-road—Improvements in swing looking glasses.

242. Henry Chance, Birmingham—Improvement in the manufacture of moulded articles when using vitreous materials.

244. Joseph Fowell Walton, Sarratt-hall, Rickmansworth, and Honore Le François, Lambeth—Improvements in cleaning forks, spoons, stewpans, and other culinary utensils.

246. Auguste Mathieu Maurice de Bergevin, 27, Rue Labat, Montmartre, Paris—Improvements in preparing coal for burning, and in the furnaces employed in consuming such coal.

WEEKLY LIST OF PATENTS SEALED.

Sealed February 8th, 1856.

1792. Benjamin Williamson Pycock.
1806. Thomas Sleight.
1814. Edward Finch.
1815. Edward Finch.
1823. Thomas Hewitt.
1829. Alexander Cameron Morrison.
1830. Edmund Topham.
1832. William John Gregory.
1836. Robert Blackburn and William Lundi Duncan.
1868. Jean Jacques Danduran.
1870. David Brown and Jeremiah Brown.
1882. Francis Journeaux.
1833. William Soelman.
1907. Victor Fouchier.
1937. Emile Constantin Fritz Sautelet.
2063. Francis Gybbon Spilsbury and Frederick William Emerson.
2072. Jules Albert Hartmann.
2201. George Tomlinson Bousfield.
2249. Perceval Moses Parsons.
2436. Richard Reeves Cox.
2444. Lewis Normandy.
2538. William Kemble Hall.
2542. John Yuil Borland.
2565. Joseph Robinson.
2568. George Tomlinson Bousfield.
2728. Jean Davoust.
2747. Ebenezer Poulson.
2808. George Heron Hay and David Syme Hay.
2835. Ebenezer Rogers.

Sealed February 12th, 1856.

1833. Walter Hancock.
1838. Albert Thornton and Frederick Thornton.
1842. George Shears.
1864. William Fawcett and Francis Best Fawcett.
1866. William Maynes.
1939. Samuel Ludbrook.
1964. Paul Eugène Charton.
2006. James Henry Bull.
2120. John Palmer.
2154. Matthew Atkinson and Benjamin Ridge, M.D.
2558. William Foster.
2646. Samuel Cunliffe Lister and James Warburton.
2664. James Clark.
2667. William Edward Newton.
2669. Hiram Hyde.
2706. Samuel Cunliffe Lister.
2802. Alexandre Forot.

PATENTS ON WHICH THE THIRD YEAR'S STAMP DUTY HAS BEEN PAID.

February 5th.

412. William Bridges Adams.
472. Thomas Browne Jordan.

February 6th.

335. Auguste Edouard Loradoux Bellford.

February 7th.

344. Richard Archibald Brooman.
545. Robert Craib Ross.

February 8th.

360. George Hutchinson.

February 9th.

374. George Henry Bursill.

WEEKLY LIST OF DESIGNS FOR ARTICLES OF UTILITY REGISTERED.

No. in the Register.	Date of Registration.	Title.	Proprietors' Name.	Address.
3809	February 7.	Improved Sash Frame Guide Pulley......	Thomas and Charles Clark.	Wolverhampton.